FEB 1 1912

VOL. CXLIII, No. 2 FEBRUARY, 1912 No. 479

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES

EDITED BY GEORGE MORRIS PIERSOL, M.D.

CECUM MOBILE. By JOSEPH SAILER, M.D. 157

THE LUMBAR TYPE OF INTERMITTENT CLAUDICATION. By J. RAMSAY HUNT, M.D. . 173

ACUTE YELLOW ATROPHY OF THE LIVER IN CHILDREN, WITH REPORT OF A CASE. By JOHN PHILLIPS, M.D. 177

TREATMENT OF NOCTURNAL ENURESIS IN CHILDREN. By JOHN RUHRÄH, M.D. . 185

SOME APPLICATIONS OF THE CREHORE MICROGRAPH, WITH ESPECIAL REFERENCE TO THE RECORDING OF HEART SOUNDS. By J. H. AUSTIN, M.D. 193

SARCOMA OF THE TONGUE AND CONDITIONS WHICH SIMULATE IT. By EDWARD MILTON FOOTE, M.D. 198

THE INFLUENCE OF ORAL SEPSIS ON DIGESTIVE DISORDERS. By GEORGE M. NILES, M.D. 217

THE PROGNOSTIC VALUE OF THE UROCHROMOGEN AND DIAZO REACTIONS IN PULMONARY TUBERCULOSIS. A PRELIMINARY REPORT. By ROY C. HEFLEBOWER, U.S.A. 221

ON AGAR AS A VEHICLE IN INTESTINAL THERAPEUTICS. By MAX EINHORN, M.D. . 230

REACTIONS INDUCED BY ANTITYPHOID VACCINATION. By HENRY ALBERT, M.D., and A. M. MENDENHALL, M.D. 232

A CASE OF BRAIN TUMOR SUCCESSFULLY LOCATED BY MEANS OF THE X-RAYS. By JAMES HENDRIE LLOYD, M.D., and LEVI J. HAMMOND, M.D. 241

THE RÖNTGEN RAYS IN HYPERTROPHIED PROSTATE: A THERAPEUTIC STUDY. By JAMES W. HUNTER, JR. M.A., M.D. 247

CANCER OF THE OVARY IN A GIRL, AGED ELEVEN YEARS. By FRANK H. LAHEY, M.D., and SAMUEL R. HAYTHORN, M.D. 257

PHYSICAL EXERCISE AND BLOOD PRESSURE. By EDWARD O. OTIS, M.D. 268

PHILADELPHIA AND NEW YORK
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NEW WORK JUST READY

A TREATISE ON

TUMORS

FOR THE USE OF PHYSICIANS AND SURGEONS

By ARTHUR E. HERTZLER, M.D.

of Kansas City, Mo., Assistant Professor of Surgery in the University of Kansas

Octavo, 728 pages, with 538 illustrations and 8 plates. Cloth, $7.00, net; half Persian morocco, gilt top, de luxe, $9.00, net.

The enormous importance of tumors arises from many factors. Tracing their origin to many pathological causes, and capable of invading every tissue in the body, they are among the most frequent of human afflictions. Even if they were in themselves always benign, the obstruction they cause in normal functions and the deformity they frequently present would often call for surgical intervention. When to all this is added the fact that tumors are the most frequent starting point of cancer, with its prolonged agonies, and that early recognition and extirpation are the only cure, the necessity of a special volume, bringing the general practitioner and the surgeon into co-operation, is manifest. Such a work Professor Hertzler has undertaken to provide. It is the result of many years of research and practice. The author has presented his full and mature knowledge, embodying familiarity with the literature of the subject, the observations of laboratory study and long experience in operating and its results. His work, profusely illustrated with original drawings, is one of prime importance to students, practitioners, surgeons and specialists.

FROM THE PREFACE

This treatise embodies the experience of many years gained in the operating-room, the observations of laboratory study and the information gathered in the library, combined in such proportions as my duties in teaching students and as a surgical consultant have shown to be most advisable.

The aim of the book is to give students and practitioners a guide to the proper recognition of tumors. Available books dealing with this subject are either broadly clinical or entirely scientific. A proper comprehension of any tumor demands the application of both the scientific viewpoint and clinical observation. The aim has been to supply this need. For this purpose it was thought best to place the chief emphasis upon the practical aspects of the subject and to include as well sufficient of the more abstract considerations to make the practical side broadly intelligible.

In view of the essentially practical character of the work, the vast field of experimental oncology has been entirely omitted because, in the first place, the results, promising as they are, have not yet attained a state of practical utility, and would but confuse the student and practitioner; and, in the second place, those who are engaged in tumor research necessarily work in laboratories where experienced personal guidance is available.

Citations of literature have been incorporated particularly in those chapters where existent opinion is still divergent. These are presented that the student may follow the subject and as an apology for the unqualified presentation of the author's view points. Papers with bibliographies most likely to be accessible to the reader have received preference.

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CONTENTS

ORIGINAL ARTICLES

Cecum Mobile 157

By Joseph Sailer, M.D., Assistant Professor of Medicine in the University of Pennsylvania, Philadelphia.

The Lumbar Type of Intermittent Claudication 173

By J. Ramsay Hunt, M.D., Associate Professor of Neurology in the College of Physicians and Surgeons, Columbia University, New York.

Acute Yellow Atrophy of the Liver in Children, with Report of a Case . . . 177

By John Phillips, M.D., Assistant Professor of Medicine, Western Reserve University, Cleveland.

Treatment of Nocturnal Enuresis in Children 185

By John Ruhräh, M.D., Professor of Diseases of Children and Therapeutics in the College of Physicians and Surgeons, Baltimore.

Some Applications of the Crehore Micrograph, with Especial Reference to the Recording of Heart Sounds 193

By J. H. Austin, M.D., Associate in Research Medicine in the University of Pennsylvania, Philadelphia.

Sarcoma of the Tongue and Conditions Which Simulate It 198

By Edward Milton Foote, M.D., Adjunct Professor of Surgery in the New York Polyclinic.

The Influence of Oral Sepsis on Digestive Disorders 217

By George M. Niles, M.D., Professor of Therapeutics and Gastro-enterology, Atlanta School of Medicine; Gastro-enterologist to the Tabernacle Infirmary, Atlanta Hospital, and Antituberculosis Association, Atlanta.

The Prognostic Value of the Urochromogen and Diazo Reactions in Pulmonary Tuberculosis. A Preliminary Report 221

By Roy C. Heflebower, First Lieutenant, Medical Corps, U. S. Army; Pathologist, U. S. A. General Hospital, Fort Bayard, New Mexico.

On Agar as a Vehicle in Intestinal Therapeutics 230

By Max Einhorn, M.D., Professor of Internal Medicine in the New York Post-graduate Medical School, New York.

Reactions Induced by Antityphoid Vaccination 232

By Henry Albert, M.D., Professor of Pathology and Bacteriology, University of Iowa, and A. M. Mendenhall, M.D., Instructor in Pathology and Bacteriology, University of Iowa, Iowa City.

A Case of Brain Tumor Successfully Located by Means of the X-rays . . 241

By James Hendrie Lloyd, M.D., Neurologist to the Philadelphia General Hospital, and to the Methodist Episcopal Hospital, and Levi J. Hammond, M.D., Surgeon to the Methodist Episcopal Hospital, Philadelphia.

The Röntgen Rays in Hypertrophied Prostate: A Therapeutic Study . . 247

By James W. Hunter, Jr., M.A., M.D., Norfolk, Va.

Cancer of the Ovary in a Girl, Aged Eleven Years 257

By Frank H. Lahey, M.D., Junior Visiting Surgeon, Long Island Hospital, Boston; Instructor in Surgery, Tufts College Medical School, and Samuel R. Haythorn, M.D., Assistant Professor of Pathology, University of Pittsburg (Formerly in the Department of Pathology, Harvard Medical School, and Pathologist to Long Island Hospital).

Physical Exercise and Blood Pressure 268

By Edward O. Otis, M.D., Professor of Pulmonary Diseases and Climatology, Tufts College Medical School; Consulting Physician, Massachusetts State Sanatorium, Rutland; Physician-in-chief, Tuberculosis Department, Boston Dispensary.

REVIEWS

A Manual of Practical Hygiene for Students, Physicians, and Health Officers. By Charles Harrington, M.D., and Mark W. Richardson, M.D. 279

Diet in Health and Disease. By Julius Friedenwald, M.D., and John Ruhräh, M.D. 280

Surgical After-treatment. A Manual of the Conduct of Surgical Convalescence. By L. R. G. Crandall, A.M., M.D. 281

A Text-book of Meat Hygiene. With Special Consideration of Antemortem and Postmortem Inspection of Food-producing Animals. By Richard Edelmann, Ph.D., John R. Mohler, A.M., V.M.D., and Adolph Eichhorn, D.V.S. 282

The Principles of Pathology. By J. G. Adami, M.A., M.D., LL.D., F.R.S., and Albert G. Nicholls, M.A., M.D., D.Sc., F.R.S. (Can.) . . . 283

Hydrotherapy. By Guy Hinsdale, M.D. 285

The Surgery of the Diseases of the Vermiform Appendix and their Complications. By William Henry Battle, F.R.C.S., and Edred M. Corner, M.A., M.B., M.C., F.R.C.S. 287

A Text-book of General Bacteriology. By Edwin O. Jordan, Ph.D. . . 289

The Medical Record Visiting List or Physicians' Diary for 1912 . . . 290

PROGRESS OF MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

W. S. THAYER, M.D., AND ROGER S. MORRIS, M.D.

Secondary Infection in Pulmonary Tuberculosis 291
The Incoagulable Nitrogen of Puncture Fluids, with Special Reference to Cancer 292
Nephritic Edema 292
On the Bence-Jones' Body 293

SURGERY

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D., AND T. TURNER THOMAS, M.D.

The *X*-rays in Renal Tuberculosis 294
Concerning the Pathogenesis of Acute Pancreatic Diseases 294
Immediate and Remote Results of Fifty-seven Nephrectomies for Renal Tuberculosis 295
Bacteriological Examination of the Blood in Anthrax 296
Experimental and Literary Studies Concerning Extensive Resections of Small Intestine 296

THERAPEUTICS

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.

The Treatment of Quartan Malaria with Salvarsan 297
Soy Bean Cookery 297
The Practical Application of a Salt-poor Diet 297
Clinical Results of the Treatment of Gout and Other Joint Affections with Radium Emanations 298
The Influence of Treatment on the Wassermann Reaction in Syphilis . 298
The Treatment of Pleurisy 299

PEDIATRICS

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.

Secretion of the Mammary Glands in Infants an Index to the Mother's Nursing Power 300
The Standard Role of the Salts in Mother's Milk in Infancy and Childhood 301

Reactions Induced by Antityphoid Vaccination 232

By Henry Albert, M.D., Professor of Pathology and Bacteriology, University of Iowa, and A. M. Mendenhall, M.D., Instructor in Pathology and Bacteriology, University of Iowa, Iowa City.

A Case of Brain Tumor Successfully Located by Means of the X-rays . . 241

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The Principles of Pathology. By J. G. Adami, M.A., M.D., LL.D., F.R.S., and Albert G. Nicholls, M.A., M.D., D.Sc., F.R.S. (Can.) . . . 283

Hydrotherapy. By Guy Hinsdale, M.D. 285

The Surgery of the Diseases of the Vermiform Appendix and their Complications. By William Henry Battle, F.R.C.S., and Edred M. Corner, M.A., M.B., M.C., F.R.C.S. 287

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The Medical Record Visiting List or Physicians' Diary for 1912 . . . 290

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W. S. THAYER, M.D., AND ROGER S. MORRIS, M.D.

Secondary Infection in Pulmonary Tuberculosis 291
The Incoagulable Nitrogen of Puncture Fluids, with Special Reference to Cancer 292
Nephritic Edema 292
On the Bence-Jones' Body 293

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J. WILLIAM WHITE, M.D., AND T. TURNER THOMAS, M.D.

The *X*-rays in Renal Tuberculosis 294
Concerning the Pathogenesis of Acute Pancreatic Diseases 294
Immediate and Remote Results of Fifty-seven Nephrectomies for Renal Tuberculosis 295
Bacteriological Examination of the Blood in Anthrax 296
Experimental and Literary Studies Concerning Extensive Resections of Small Intestine 296

THERAPEUTICS

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SAMUEL W. LAMBERT, M.D.

The Treatment of Quartan Malaria with Salvarsan 297
Soy Bean Cookery 297
The Practical Application of a Salt-poor Diet 297
Clinical Results of the Treatment of Gout and Other Joint Affections with Radium Emanations 298
The Influence of Treatment on the Wassermann Reaction in Syphilis . 298
The Treatment of Pleurisy 299

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Secretion of the Mammary Glands in Infants an Index to the Mother's Nursing Power 300
The Standard Role of the Salts in Mother's Milk in Infancy and Childhood 301

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.

Double Congenital Dislocation of the Hip and its Effect upon the Pelvis . 302
Pituitrin as a Stimulant in Labor 302
Pregnancy Complicated by Acromegaly 303
The Mortality of Parturition 304
The Pelvic Kidney 304

GYNECOLOGY

UNDER THE CHARGE OF

JOHN G. CLARK, M.D.

Endometritis 305
Electricity in Gynecology 306
Tuberculosis of the Female Genital Organs 307

OTOLOGY

UNDER THE CHARGE OF

CLARENCE J. BLAKE, M.D.

A Foreign Body (Revolver Bullet) in the Temporal Bone Removed by Means of the Radical Operation 308
The Labyrinth Fistula Symptom 308
Examination of 200 Persons over Fifty Years of Age in Reference to Their Hearing Power 308
Suppurative Inflammation of the Middle Ear Relieved by Antisyphilitic Treatment 309
Operation for the Relief of Intense Labyrinthine Vertigo 309

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

JOHN McCRAE, M.D., M.R.C.P.

A New Pasteur Institute 310
The Chemistry of the Cell 310

CLB251594

THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

FEBRUARY, 1912

ORIGINAL ARTICLES

CECUM MOBILE.[1]

By Joseph Sailer, M.D.,

ASSISTANT PROFESSOR OF MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

By cecum mobile is meant an abnormal motility of the cecum and lower portion of the ascending colon. This may be purely anatomical and give rise to no clinical symptoms, or, as a result of movement of the cecum, kinks may be produced, causing partial or temporary obstruction ultimately giving rise to more or less atony and dilatation of the cecum with associated clinical symptoms.

The term was first employed by Haussmann,[2] who in 1904 reported 8 cases characterized by fairly similar clinical signs, the cause of which he ascribed to this abnormal condition whose existence he determined purely by physical examination.

The various malpositions of the large bowel have been the subject of attention on the part of anatomists for many centuries, and Schultz[3] has collected the description of these anomalies in Morgagni's writings. Curschmann,[4] in 1894, was the first to attempt a systematic study of the possible relation of these malpositions to various clinical manifestations. In the course of this article he describes several cases of reflection upward of the cecum with a

[1] Read before the College of Physicians of Philadelphia, November 1, 1911.

[2] Berlin. klin. Woch., 1904, No. 44, p. 1153.

[3] Case 14. "The beginning of the ascending colon lay deeper than normal." Case 19. "The ascending colon was so bent and doubled upon itself that the fundus of the cecum, directed upward, touched the portion of the transverse colon lying under the liver." Case 3. "The colon overlying the small intestines passed upward from the right hypochondrium to the umbilicus." Vesalius has pictured the reflection upward of the colon.

[4] Deutsch. Archiv f. klin. Med., 1894, liii, 1.

sharp kink that caused complete obstruction; in one instance the blind end of the cecum was close to the edge of the liver. He was able to demonstrate that anomalies of the mesentery and mesocolon were responsible for these displacements, and therefore indirectly for the clinical symptoms. He noted also that when the attachment of the mesocolon of the cecum to the posterior parietal peritoneum did not occur, the cecum might be found in the region of the umbilicus, giving rise to a "Wander cecum" or floating cecum.

Haussmann's 8 cases were all characterized by attacks of colic, usually beginning with constipation, and the presence during the attacks of a movable tumor in the right lower quadrant of the abdomen that could be pushed upward leaving an empty space in the right iliac fossa. The number of his cases has since been increased to 143, none of which, curiously enough, at the time of his last publication, had been confirmed either by autopsy or operation, chiefly he complains because consultants did not recognize the existence of the condition, and therefore would not concur in the diagnosis. His paper attracted very little attention, and it was not until Wilms[5] reported 40 operative cases that the physicians of Germany began to regard cecum mobile as an actual clinical disease. He had observed that many cases of so-called chronic appendicitis were not relieved by appendectomy, particularly if the appendix was not adherent, and inferred that his inability to obtain statistics regarding the end results of operations for chronic appendicitis was due to the uncertainty and indefinite character of the benefit derived from them. It occurred to him, therefore, that other factors than disease of the appendix might be active in causing the symptoms, and after some study he reached the conclusion that the pain at least might be due to a long cecum mobile. This might permit the stretching or tearing of the nerves in the mesentery and mesenteriolum, and at any rate be responsible for the tenderness at McBurney's point. These cases in which the appendix and cecum are freely movable, are theoretically not curable by appendectomy alone, and accordingly he devised an operation for the fixation of the cecum by means of broad adhesions to a sort of pocket formed in the iliac fossa. In 40 cases this gave good results.

The observation of Wilms that operations in cases of so-called chronic appendicitis failed in many cases to relieve the symptoms had been frequently made by clinicians prior to the publication of his article. Albu,[6] in particular, had called attention to this point, although he did not suggest any satisfactory explanation. It is noteworthy that in the text-books of neither Deaver nor Kelly are any statistical studies made of their operative results in these conditions, although the experience of both must be very large.

[5] Deut. med. Woch., 1908, p. 1756; Zentralbl. f. Chirurgie, September 12, 1908, p. 247.
[6] Deutsch. med. Woch., 1905, No. 26, p. 1065.

In the brief period that has elapsed since Wilms' article, cecum mobile has excited the liveliest interest among the German and Russian internists and surgeons. Fischler,[7] in 1909, was able to report 41 cases and to give the first comprehensive description of the symptoms from the medical standpoint, and Klose,[8] in a series of articles published in 1910, again discussed the diagnosis and reported the results of surgical measures in 12 cases. Of these 12 the first 7 were discovered only after the abdomen had been opened, but with the experience gained from these the last 5 were diagnosticated before operation. Wiemann,[9] Heiler,[10] and Straschenko,[11] have also reported cases and discussed the condition. So far as I know, it has not attracted the attention of French, English, or American medical writers.

The anatomical basis appears to be a congenital malformation of the mesocolon of the cecum, of such a nature that for some distance along the ascending colon it maintains the type of the mesentery and is not attached to the parietal peritoneum.[12] This permits to the part at large all the freedom of movement characteristic of a loop of small intestines, and, indeed, as a result of the greater length of the mesentery and the less confined position of the first portion of the colon, considerably greater displacement may take place. That this malformation occurs, as the Germans contend, in the latter part of the second month of pregnancy appears to me to be an illogical assumption. It first becomes manifest when the primitive gut begins to differentiate, but the predisposition must exist from the beginning of independent embryonal existence. This defect of the mesocolon is, of course, not in itself a morbid condition, and may exist without giving rise to any clinical manifestations whatever, but it renders certain forms of obstruction possible that cause the attacks and secondarily the distention and atony of the cecum. These obstructions are of three types: (1) The formation of a kink usually near and below the hepatic flexure; (2) the reflection upward and forward of the cecum upon the ascending colon until, indeed, in the most extreme cases, the caput coli may touch the liver; (3) volvulus of the cecum. Two cases of the second type and one of the third type were reported by Curschmann. These, however, are not the only lesions that may give rise to these symptoms, for not less than 3 of Klose's 12 cases showed at operation, adhesions pulling the cecum downward and thus producing obstruction.

[7] Mitteil. a. d. Grenzgebeit d. Med. u. Chir., 1909, xx, 663.

[8] Beiträge z. klin. Chirurgie, 1909, vol. lxiii, Heft 3; Fortschr. d. Med., 1909, No. 16; Münch. med. Woch., 1910, p. 348.

[9] Deutsche med. Woch., 1909, p. 146.

[10] Münch. med. Woch., 1910, No. 11, p. 587.

[11] Archiv. f. Verdauungskrankheiten, Band xvii, Heft 1.

[12] This condition usually extends for from one-half to two-thirds of the length of the ascending colon, according to Wandel, and in six of his seven cases as far as the liver.

Haussmann recognizes two varieties—(1) passive mobility, and (2) spontaneous mobility. The latter is subdivided into three types according to the level to which the caput coli can be displaced—to the crest of the ilium, above the crest, and to the costal margin. I have yet to observe a case in which I could demonstrate to my satisfaction any such extreme motility as in the third type.

There appears to be much difference of opinion regarding its frequency, a difference due in large part to varying standards. It is, therefore, impossible to compare or even to attempt to reconcile the figures that have been given by various investigators. Thus an abnormally movable cecum was found by Engel,[13] in 10 per cent. of the subjects he examined; Treves[14] found extreme motility in 11 of his 100 dissections; Dreicka found a common mesentery of the ileum and cecum in 23 per cent. of the cadavers that he examined. The most important statistics are those given by Wandel.[15] In 640 autopsies carefully studied with reference to this particular point, he found in 66 mobility of sufficient degree to permit kinking, torsion or displacement; of these, 28 were children, and although the whole number of children examined is not given, it is stated that the proportion is greater than in adults. In 8 of the 66 cases, the cecum was turned forward and upward, but in the majority the position of the organ was normal. In regard to the frequency with which symptoms are produced, I have found only one definite statement. During the period in which Klose and Rehn operated upon 12 cases of cecum mobile, they also operated upon 80 cases of chronic appendicitis; that is, 15 per cent. of all supposed cases of chronic appendicitis may be due to cecum mobile.

The figures of Haussmann[16]—143 cases observed in six years—indicate an enormous clinical material; a readiness to make the diagnosis, or a singular blindness on the part of the whole medical profession to a very common condition. Fischler gives no definite figures, but is content to surmise that "a large part of the troubles heretofore collected under the name of chronic appendicitis is due to a more or less pronounced muscular insufficiency of the cecum, a typhlatonia." He has observed 41 cases, but fails to state in how long a period, or what proportion they formed of his other cases. Indirect evidence may be found in the article of Wandel, who has collected from the literature a large number of cases of volvulus of the cecum and ascending colon which were only possible as a result of their abnormal mobility.

There appears to be some difference of opinion regarding the symptomatology of these cases. According to Fischler the clinical

[13] Wien. med. Woch., 1857, No. 30 to 41, p. 553 et seq.
[14] British Medical Journal, 1885, p. 474.
[15] Mitteil. a. d. Grenzgebiete d. Medizin u. d. Chirurgie, vol. xi, p. 39.
[16] Die methodische Intestinale Palpation, Berlin, 1910.

picture is fairly uniform. Attacks of colic occur at irregular intervals, but with a general tendency to increase in frequency, severity, and duration. Each usually begins with a longer or shorter period of constipation, and there is severe pain lasting for a few hours, about two according to Klose, or more rarely for several days, and terminating in a copious discharge of feces. During the attack there is loss of appetite and perhaps nausea and even vomiting; the temperature is either normal or, if fever occurs, it is slight. The leukocyte count is normal. A mass can be felt in the right lower quadrant about the size of a small apple, firm, but not hard, and elastic, but not doughy. Nothing can be felt on the left side. Tenderness is usually present, and is most distinct near McBurney's point. Gurgling can usually be elicited. Posture has a pronounced effect upon the pain. If the patient stands or sits the pain is worse. It is relieved, and indeed the attack may sometimes be terminated, if the patient lies upon the back or particularly upon the right side. Predisposing factors are exertion and the indulgence in food that produces flatulence. During the interval the patient may be subjectively well, but usually symptoms of chronic colitis are present; that is, alternating diarrhea and constipation, mucus in the stools, and intestinal flatus. In spite of Fischler's large experience, it seems that such a characteristic clinical picture cannot be present in the majority of cases, and I am, therefore, more inclined to agree with Wiemann,[17] who believes that obstinate constipation not yielding to laxatives is the most characteristic feature. Haussmann is more interested in the physical examination of his patients than in the symptomatology. Klose apparently considers that the symptom complex ascribed to chronic appendicitis is also the symptom complex of cecum mobile.

The physical signs are those by which the displacement, the distention, and the atony of the cecum are recognized. They may be divided into signs obtained by palpation, by inflation of the colon, and by the *x*-rays. That the cecum can be palpated in a large percentage of cases is no longer a matter of dispute. Clinicians have obtained somewhat different figures, depending upon their skill and material, since Franz Glenard first described the *boudin cecale*. Obrastow,[18] in 109 men found a palpable cecum 56 times, or in 51.4 per cent., and in 60 women, 35 times, or 58 per cent. Haussmann claims to have palpated the cecum in no less than 256 of 300 persons, or in 80 per cent.

In order to test this subject I have analyzed the results of the physical examinations of the abdomen made upon 312 office patients within the last year. The conditions of the examinations in all these patients were approximately the same. They were all

[17] Deut. med. Woch., 1909, p. 146.

[18] Archiv f. Verdauungskrankheiten, vol. i, p. 265.

ambulant patients, and represented a considerable variety of clinical conditions, many of them having no symptoms referable to the abdomen whatever. Sixty-two, or about 20 per cent. had a distinctly palpable cecum. This varied from a soft, indefinite, movable mass to a distinctly palpable, tympanitic, balloon-like body. The position was variable, in some cases nearer the anterior superior spine, and in others nearer the median line. The lower edge, as determined by palpation and percussion, varied between a point 2 inches below the interspinal line to a point 1½ inch above it. In many cases no note was made of its exact position, and therefore the frequency of these variations cannot be given. In nineteen of these sixty-two cases, that is, in about 30 per cent., there was more or less tenderness. As a rule, this amounted merely to some discomfort upon deep firm pressure, and was not associated with flinching or ridigity. Tenderness of this character was not recorded as such unless it was not present simultaneously at the corresponding point on the left side. In a few cases there was slight rigidity. There were no cases of certain acute appendicitis seen in the office. In 52 cases, about 17 per cent., there was slight tenderness of about the same degree over McBurney's point, not associated with a palpable colon. This was frequently variable, being found only once in a series of observations. At other times it was more or less constant, and probably indicated the existence of a chronic appendicitis or of some other inflammatory lesion in this region.

In the atonic condition the cecum is felt as a somewhat indistinct cylindrical or pear-shaped mass that can be passively displaced. It is usually tender, but rigidity and flinching are rarely observed. If present they suggest an inflammatory complication. Gurgling on pressure is a characteristic sign, splashing is rare. It may be possible to cause air to pass through the ileocecal valve into the ileum according to Hertz's method, but this would be at best difficult to recognize. A diminished resistance just below McBurney's point, or a hollowness of the iliac fossa due to the upward movement of the cecum has also been noted by Haussmann. Inflation gives rise to two signs—disproportionate distention of the cecum and more or less evidence of insufficiency of the ileocecal valve. Regarding the former the explanation of Anschuetz[19] appears to have been unreservedly accepted. This is as follows: If two dilatable bodies with walls of the same elasticity are subjected to the same dilating force, the degree of dilatation is proportionate to the squares of the diameters. That is, if the lumen of the cecum is two or three times as great as that of the transverse or descending colon, the former will be dilated from four to nine times as much. Evidence of insufficiency of the ileocecal valve is the tympanitic distention

[19] Archiv f. klin. Chirurgie, 1902, lxviii, 195.

of the central parts of the abdomen. This condition was carefully studied by Hertz,[20] who ascribed to it the symptoms of constipation and flatulence. He also observed, in 1902, cases that might now be diagnosticated as typhlatonia or cecum mobile. The experimental inflation of the colon in these cases nearly always precipitates a characteristic attack.

The information yielded by the *x*-ray pictures of the colon has been studied carefully only by Klose. Ordinarily at the end of twenty-four hours a suspension of bismuth taken by the mouth is found in the descending colon and the rectum. In cecum mobile it remains in the cecum for two or three days. This finding, however, is only significant if associated with other clinical manifestations of the condition, and, if absent, cecum mobile cannot always be excluded, for at the end of an attack the bismuth rapidly disappears from the cecum. I am inclined to believe that this will also be found to be true during the normal intervals. Straschenko believes that the *x*-rays are of little aid in the diagnosis.

I have had *x*-rays taken of 5 cases in which I suspected cecum mobile, for the purpose of determining whether bismuth persisted in the cecum for more than forty-eight hours. Four cases were positive and 1 negative. In all the positive cases the persistence of the bismuth in other portions of the colon, especially the transverse and descending colon, was quite as marked as it was in the cecum, although, as can be seen from the illustrations, the cecum appears to be a region of particular accumulation, and there is a somewhat clearer area in the neighborhood of the hepatic flexure. This accumulation in the transverse and descending colon, is not noted by Klose, perhaps, because he considers it comparatively unimportant or because it did not occur. It is in my experience, and in the experience of Dr. Pancoast and Dr. Pfahler, not uncommon. It seems to me that it suggests that possibly more factors than the mobility of the cecum and lower part of the ascending colon are involved in these cases.

The clinical picture is still, as Wiemann says, uncertain. The differential diagnosis is as yet based rather upon theoretical than upon practical considerations. Cecum mobile is commonly mistaken for chronic appendicitis, and the distinction is rendered more difficult by the probability that the appendicitis forms a frequent complication. As Klose and Rehn, and Wilms, the only surgeons to report any number of cases, invariably remove the appendix, its role in the production of the symptoms can only be guessed. Wilms, however, in 5 cases removed the appendix and did not fix the colon, and none of them were benefited by the partial operation. For the direct diagnosis, Wilms depends upon the possibility of bringing the cecum to a position in front of the wound; Klose,

[20] Wien. klin. Woch., 1902, p. 347.

upon the retention of the bismuth in the cecum for more than forty-eight hours. Tenderness over McBurney's point and constipation are common symptoms; the signs of distended or relaxed colon, the gurgling on palpation, and particularly the attacks of pain relieved by posture, when it can be obtained, may suggest abnormal mobility of the cecum or typhlatonia. Of the other confusing conditions, the most important are probably disease of the right ovary or tube in women, movable tender kidney, regarded by Haussmann as the commonest mistake, and adhesions following appendectomy. Cholelithiasis, pseudo-appendicitis, a very doubtful condition, and colica appendicularis, the correct diagnosis of which must require unusual skill, have also been mentioned by Fischler. The prognosis is usually favorable in the milder forms, at least death does not result, but some of the severer types of obstruction may lead to strangulation, peritonitis, and other grave complications, as in the cases reported by Wiemann, Heiler, and Straschenko.

The treatment is by no means definitely determined. Albu believes that internal measures, such as regulation of the diet, laxatives, massage of the abdomen, and prolonged rest, may be successful. Fischler advises a diet somewhat restricted and carefully adapted to the patient, massage, exercise to strengthen the abdominal muscles, and the administration of bismuth, combined, if necessary, with magnesia and rhubarb, or if there is diarrhea, bismuth salicylate may be used. Purgatives and oil and other enemas should be avoided.

The majority of writers, Haussmann, Wilms, Klose, regard surgery as the only satisfactory remedy. The nature of the operation is not settled. Wilms dissects upward a portion of the parietal peritoneum, leaving a pocket into which the cecum is sutured. Rehn and Klose simply attach the cecum to the lateral abdominal wall by sutures, securing a broad area of adhesions. This would seem sufficient in ordinary cases. As in all new operations for chronic conditions, the results are apparently uniformly favorable; at least, none that are unfavorable are reported, although Wilms speaks only in general terms, and Klose does not give the final results in all his cases.

I can easily understand why the fixation of the cecum should prevent recurrent attacks of colic, if they are due to temporary obstruction, but it is not clear to me why it should relieve a chronic constipation or restore the contractibility of an atonic colon, and, therefore, purely upon theoretical grounds, it would seem desirable at the time of the operation to correct all displacements, kinks, or folds that are giving rise, or may in the future give rise to partial or complete obstruction.

Case I.—Miss E. H., three years ago complained of feeling in poor condition, sleeping badly, suffering from rumbling and flatus in the bowel. There was habitual constipation, only partly relieved

Left Right

FIG. 1.—Case I. Two ounces of bismuth subcarbonate taken at 9 A.M. First exposure same day at 2.15 P.M. Plate shows a greatly distended and ptosed cecum, the lower end of the cecum being below the upper border of the symphysis. Some of the bismuth has also passed into the transverse colon which is lifted by the distended cecum. The bismuth has not quite reached the splenic flexure. There is no bismuth in the stomach and mere traces in the small intestines. Therefore the motility of the stomach and small intestines is normal.

Left Right

FIG. 2.—Case I. Same patient. Picture taken at 9.15 A.M., two days later, without further ingestion of bismuth. There is still a slight accumulation of bismuth in the cecum. The main mass is in the transverse colon.

by laxatives. In the past she had had frequent vomiting. On the first examination it was noted that the heart and lungs were normal. There was some tympany on the right side of the abdomen, and peristalsis was diminished, but no tenderness was found. Various laxative remedies and diets were tried, and the patient's weight, originally about 130 pounds, increased steadily. Occasionally the cecum was palpable and gurgling was detected, but this was not invariably the case. The sigmoid flexure could also be felt from time to time as a firm cylindrical mass. About two years after the first visit, very distinct tenderness was elicited over McBurney's point. The ascending colon at this time was distinctly palpable, and was tender upon deep pressure without flinching or rigidity. She underwent then a course of massage, having been assured by the masseuse that her constipation would be relieved. This produced considerable pain in the right side of the abdomen, and occasionally some pain on the left, and the constipation was not improved. The diagnosis of chronic appendicitis was made, and as during this long period of treatment, although the patient had gained in weight, she had never been wholly well, her parents requested that an operation be performed. This was done by Dr. Martin in June, 1911. The appendix was free and easily removed, and the postoperative course was entirely normal. For a short time after this she seemed distinctly better, but by August was as bad as ever, tiring easily and being moderately anemic. The cecum could still be felt, and the lower end seemed to be about the level of the interspinal line. The patient at the last examination was improved somewhat in strength and weight, but the constipation with occasional periods of relief was practically unimproved. She was, therefore, referred to Dr. Pancoast for *x*-ray study. On October 9 two ounces of bismuth subcarbonate in suspension were given at 9 A.M. A picture was taken at 1 P.M., and showed that the stomach was empty and that a considerable amount of bismuth had already passed into the cecum. This confirmed the diagnosis of normal gastric and intestinal motility. On October 11, at 10 A.M., a second picture was taken, and it was found that the cecum still contained a considerable amount of bismuth. It was abnormally long, extending considerably below the interspinal line. There was marked ptosis, with festooning of the transverse colon (see Figs. 1 and 2).

CASE II.—Miss E. P., was first seen in February, 1908. At this time she was feeling miserably, and complained of headache and nausea in the morning, dyspnea on exertion, inability to pursue her work, some gas half an hour after eating, and occasional bloating. At the age of twenty she had had an attack diagnosticated peritonitis. Thirteen years later, when the symptoms had persisted for years, the appendix was removed. Immediately after this operation she developed typhoid fever and was in bed seven

weeks. She had always been constipated, and since the onset of menstruation she has suffered from dysmenorrhea. At this time her weight, 161 pounds, was better than it ever had been previously. She is over six feet tall, however, and appeared poorly nourished. The abdomen was moderately tympanitic; there was considerable splashing in the stomach, and a good deal of tenderness over the right side of the abdomen and hyperesthesia in the same region. All the tendon reflexes were greatly exaggerated. The blood pressure was low. The patient stated that the ghost of her appendix had come back to haunt her, because there had been no relief from pain after the operation. The cecum was quite palpable, and from time to time gurgling was present. Considerable relief was given by the

FIG. 3.—Case II. But one plate was taken forty-eight hours after the ingestion of two ounces of bismuth subcarbonate. This plate was not sharp enough for correct reproduction and the outlines of the shadows could only be seen by holding it obliquely to the light. The sketch is an approximate reproduction of the shadow which indicates an enormous dilatation and retention in the cecum. The transverse colon is in good position and shows the permanent results of the Coffey operation done one and one-half years ago.

application of adhesive straps to relieve the ptosis of the colon, but the constipation was difficult to overcome. The patient slept badly and had vivid dreams. She steadily lost weight, and the marked persistence of the tenderness led finally to the decision to examine the lower end of the colon in order to find out whether adhesions or some other condition could account for her disability. This was done by Dr. Clark, who found a few adhesions, which he severed, and closed the wound. Recovery from the operation was uneventful, but the patient was unimproved. She then decided to spend the winter in Italy, in the hope of overcoming what one of her physicians believed to be a neurasthenic state. Unfortunately, she was in Sicily at the time of the earthquake, and believes that her failure to improve was due to the excitement of this period.

Upon her return a lump developed in the left breast, which was amputated by Dr. George Ross. Microscopic examination showed, however, that the tumor was a simple fibroma. Prolonged rest cure under favorable conditions failed to give any relief; indeed, the patient seemed to be worse, and in view of the profound ptosis of the colon shown by *x*-rays, it was finally decided, after several consultations, that Dr. Clark should again operate. This he did, resecting a considerable portion of the sigmoid flexure and performing Coffey's operation to relieve festooning of the transverse colon. This operation was only performed at the earnest request of the patient, who was willing to submit to anything in order to regain her health. There was no improvement, and the patient is now apparently a permanent invalid. The diagnosis is not definite, but I can recollect distinctly at the time of the second and fourth operations, at both of which I was present, that the cecum moved very freely, and was rather long and distinctly distended. This did not attract the attention of any of us at the time, but the history of the case, the prolonged constipation, the failure to improve after the removal of the appendix, the palpable colon, all lead me to conclude that part of her troubles are due to an unfixed cecum. The *x*-ray taken two days after the administration of two ounces of bismuth showed marked retention in the cecum (see Fig. 3).

Case III.—M. R. B., was first seen in February, 1908. She was then a girl, aged fifteen years, who had been criminally overworked at school, being occupied from 6 A.M. until 8 P.M., and spending her recesses practising on the piano. As a child she had been well and strong. About the age of thirteen she began to have cramps in the abdomen. These would begin with severe pain in the right lower quadrant, and were sometimes associated with nausea and vomiting. As a rule, the attacks would last for twelve hours, then cease for two or three days. At first they recurred every two or three months, but later increased both in frequency and severity. In the intervals she suffered from a good deal of gas, nausea after food, and occasional vomiting. There was considerable tenderness over McBurney's point, and gurgling upon pressure on the cecum. Peristalsis appeared to be quite active on auscultation. The pulsation of the right common iliac could easily be felt. The patient complained of constipation, which was only relieved by large doses of purgative drugs. She was placed upon a rest cure, during which she gained some weight, but the constipation persisted in spite of all forms of treatment. During this time she seemed extraordinarily listless for a girl of her age, and I ascribed this to anemia, the red cells being 3,280,000. After this she steadily lost weight, going from 93 to 81 pounds. The tenderness in the right lower quadrant persisted. It was always worse during menstruation, and was supposed to be due to chronic appendicitis that was in part or

wholly the cause of the chronic constipation. Finally appendectomy was done by Dr. Edward Martin. The appendix was free. It showed slight signs of chronic inflammation. Recovery from the operation was prompt and satisfactory. There has been no improvement. The patient at various times has seen specialists in Europe, has undergone a course of osteopathy, and appears practically to have abandoned hope. No *x*-rays have been taken, but the history is typical. An occasionally palpable cecum with gurgling suggests very strongly that this is a case in which the movable cecum is accountable for the symptoms.

Left Right

FIG. 4.—CASE IV. Bismuth subcarbonate, two ounces, in suspension at 9 A.M. First picture 12.45 P.M. The stomach still contained a large amount of the bismuth which is shown clearly. It is below the umbilicus. The cecum was greatly ptosed and its shadow can be seen extending beneath the ramus of the pubic bone. The bismuth has not distinctly reached the transverse colon.

CASE IV.—Mrs. J. B. P. was referred to me by Dr. W. R. Nicholson. She came complaining of loud gurgling and discomfort in various parts of the abdomen, periods of obstinate constipation alternating with diarrhea, and always much mucus in the stools. The appetite was poor. Menstruation was normal. The weight, 105 pounds. The cecum was palpable as a somewhat irregular freely movable mass containing some small hard lumps and the lower edge was one inch below the interspinal line. The lower edge of the liver was palpable, but the right kidney and sigmoid flexure could not be felt. This condition has persisted for years. Laxatives seemed to have fairly good results, and the bowel movements became more regular.

The appetite was poor, and the weight failed to increase. The cecum continued tender, and there was some diffuse tenderness over the whole of the lower part of the abdomen. There has been no evidence of gastric retention. There was extraordinary improvement for a short time after the application of adhesive straps. Two ounces of bismuth were administered, and *x*-ray pictures taken four and fifty-two hours later. There was no evidence of retention in the stomach or small intestines, but marked evidence of retention in the cecum for a period in excess of forty-eight hours (see Figs. 4 and 5).

Left Right

FIG. 5.—Case IV. Picture taken at 9.30 A.M. two days later. The cecum is still greatly distended with the bismuth and lifts the right side of the transverse colon which is festooned. The dilatation and motility of the cecum and ascending colon and an apparent obstruction at the splenic flexure all seem very distinct.

CASE V.—Miss A. G. C. was referred to me by Dr. Frank Craig. She complained of chronic constipation. Seven years ago she had had a slight attack of pulmonary tuberculosis, from which she had completely recovered. For two years the bowels have moved only after the administration of large doses of purgative medicine, particularly sulphate of magnesia. The feces often contain mucus, and sometimes blood. Seven years ago, after treatment for tuberculosis, she weighed 130 pounds. Her present weight is 104 pounds. The thoracic organs are normal. The cecum is distinctly palpable, the lower edge extending half an inch below the interspinal line, moves freely, but there is no gurgling and it is not tender. The sigmoid is palpable. The stomach is ptosed and atonic. Peristalsis

Left Right

FIG. 6.—Case V. Bismuth taken at 9 A.M. First plate at 12.45 P.M. same day. Stomach is ptosed, somewhat sacculated, and lies far to the left and below level of the umbilicus. The cecum is ptosed and dilated. There are traces of bismuth in the small intestines and some has already passed into the transverse colon.

Left Right

FIG. 7.—Case V. 9.30 A.M. two days later. Cecum is still considerably distended. There is also apparently considerably distention of the median portion of the transverse colon. Very little of the bismuth has been discharged.

is greatly diminished. The right kidney is in the fourth position. The patient was given bismuth and *x*-ray pictures were taken at intervals of four and fifty-two hours. These confirmed the physical examination, showing marked retention of bismuth in the cecum, and also in the large intestines (see Figs. 6 and 7).

No very definite conclusions can be drawn from this study. There seems to be no doubt that many cases are wrongly diagnosticated chronic appendicitis, that in these cases the removal of the appendix, even if it shows signs of inflammation, is not followed by the relief of the symptoms, and, therefore, some other etiological factor must be active. In no less than 3 of the 5 cases I report the appendix had been removed, and in every instance described as the seat of a chronic inflammatory process, and yet in none of those 3 was there any relief afforded, and in 1 subsequent operations were equally futile.

Although a great deal of work has been done upon the various positions of the colon, the cecum and ascending colon have been, comparatively speaking, neglected. This is due in part to the striking displacements of the transverse colon and sigmoid flexure. Recently, during an autopsy upon a case of pleural effusion and myocarditis that had died in my wards at the Philadelphia Hospital, I asked the pathologist to examine the cecum, and he found that it was not attached to the abdominal wall until a point midway between its beginning and the hepatic flexure was reached, and that, moreover, the lower end was reflected backward for a distance of two inches and fastened by adhesions between the two surfaces of cecal peritoneum. This is only mentioned as an illustration of the ease with which these anomalies may be overlooked even by a very competent pathologist.

It seems to me likely that the essential lesion in these cases is the atony which results from the partial and occasional obstruction, and I am inclined to agree with Fischler that the term typhlatonia is better than cecum mobile, but the latter appears to be now established. The mere discovery that the cecum is palpable, movable and retains bismuth for too long a period should not be regarded as an adequate explanation for obscure abdominal symptoms unless all other conditions are excluded, and from the study of my own cases I am strongly inclined to believe that the displacements of other portions of the colon, the co-existence of a catarrhal colitis or an associated chronic appendicitis will be of importance in determining the indications for treatment.

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THE LUMBAR TYPE OF INTERMITTENT CLAUDICATION.

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The peculiar and very characteristic vascular disturbance, described by Charcot,[1] in 1858, as *Intermittent Claudication* has attained a place of considerable importance in symptomatology during the last few years. At the present time, a number of clinical types are recognized, which receive their special and distinguishing characteristics from that portion of the arterial system which is involved—the tibial, brachial, coronary, mesenteric, cerebral, or spinal arteries.

Charcot's original observations were made upon cases in which the large arteries of the lower extremity were involved, with a resulting condition of intermittent limping; a state of weakness, painful cramps and paresthesia developing in the extremity while walking, disappearing after a brief period of rest (paralysie douloureuse intermittente).

The peculiar feature of this clinical picture was the intermittent character of the symptoms, their appearance only during muscular activity and their rapid disappearance in the passive state.

This unusual complex of symptoms attracted very little attention for many years and it was not until after the revival of the subject by Erb,[2] in 1898, that it began to receive general attention and interest. Erb demonstrated conclusively that symptoms of *claudication intermittente* occur not only with disease of the large arterial trunks, but that they result even more frequently from lesions in the smaller ramifications of the arterial tree, with corresponding changes in the pulsation of the pedal arteries.

These symptoms may accompany all the commoner forms of arterial disease, arteriosclerosis, senile calcification, obliterating endarteritis, acute arteritis. It is, however, not only the organic changes in the vessel walls, but an associated *vasomotor neurosis*, a tendency to vascular spasm, which narrows the lumen of the vessels and diminishes the flow of blood to the parts, with a resulting ischemia, which is the direct cause of the symptoms. The two chief factors, angiosclerosis and angioneurosis, are therefore usually combined, although Oppenheim recognizes a benign, purely functional type due to vascular spasm.

Once the symptom complex was established in the lower extremity (leg type), it was but natural that other groups of cases

[1] Claudication Intermittente, Compt. Rend. et mém. de la Soc. de Biol., 1858, t. xii, p. 225.
[2] Deut. Zeit. f. Nervenheilkunde, 1898, Band xiii, S. 1.

should be differentiated and described as special types, corresponding to different portions of the arterial tree.

Oppenheim[3] called attention to its occurrence in the upper extremity (arm type), and not a few cases of this kind have been described. In one case, in which both legs and an arm were affected, the tongue was similarly involved (Determann[4]).

Of great clinical importance are the various visceral types of the disease, such as occur with lesions of the coronary artery (angina pectoris of Potain) and of the mesenteric arteries (Ortner[5]). It has also been observed in the central artery of the retina (Rosenfeld[6]). Such a case has come under my own observation, in which the arterial spasm and resulting pallor could be seen with the ophthalmoscope.

The condition is by no means infrequent in the cerebral arteries, often as a symptom and precursor of thrombosis. Déjerine[7] has recently given a graphic picture of intermittent claudication of the vessels of the spinal cord, with pain, weakness, and paresthesiæ of the lower extremities coming on during exertion and accompanied by exaggerated tendon reflexes, ankle clonus, and the Babinski reflex, all symptoms objective as well as subjective disappearing during rest.

The Lumbar Type of Intermittent Claudication. The type to which I desire to call attention may from its location in the lower portion of the back be termed the *lumbar type* of intermittent claudication. The nature of the symptoms and their intermittent character, occurring regularly during activity, ceasing always after a short rest, would exclude all other organic conditions save one of vascular origin.

It may be that some of the painful backs occurring in and after middle life, and regarded usually as rheumatic, may have a similar origin, cases in which the intermittent character of the symptoms is less clearly defined than the one which has come under my observation.

Case Report. Mr. M. G., aged fifty-one years, unmarried, a stockbroker by occupation, was referred to me from the Roosevelt Hospital in November, 1910. He is American born and has always lived in New York. For many years he has indulged excessively in the use of alcohol, usually whisky; on the average taking from ten to fifteen drinks a day, with not infrequent periods of debauch, during which times he would consume a quart of whisky a day, often for a period of several weeks. In addition to alcoholic excesses he is a heavy eater, and for many years has indulged in large quantities of rich food. For twenty years he has not used tobacco in any form. Twenty years ago he acquired

[3] Deut. Zeit. f. Nervenheilkunde, 1900, Band xvii.
[4] Ibid., 1907, Band xcii, S. 154.
[5] Wien. klin. Woch., 1906.
[6] Deut. med. Woch., 1906.
[7] Rev. Neurologique, 1906, No. 8.

syphilis, for which he received thorough treatment under the direction of a well-known New York specialist. Fifteen years ago he had a severe attack of articular rheumatism, but has had no rheumatic manifestations since that time. Has never had lumbago.

The trouble for which he consulted me began two years ago with pain in the lower part of the back, which came on only while walking. It was his custom at that time, and had been for some years, to walk to and from his place of business. He found that during these walks a pain would appear in the lumbar region and he would have to stand still a few minutes until it wore off. After standing a few minutes, usually leaning heavily against a fence or a lamp post so as to take "the weight and strain off the spine," as he expressed it, the pain would entirely disappear and he could resume his walk. While sitting, lying in bed, or on first rising in the morning, there was not a trace of pain or stiffness in the back. It developed only during his walk to the office.

As time went on he found it necessary to take more and more frequent rests, but always with the same result, a complete disappearance of the pain and perfect ability to continue his walk. In resting, it was necessary to take the strain off the muscles of the back by sitting, lying down, or, as was more frequently the case while walking, by leaning up against some object for support. He had no pain or trouble of any kind in the lower extremities. The pain was fairly well localized in the lower lumbar region and when very severe would radiate somewhat into the sides but never as far forward as the abdomen. The pain was intensely aching in character, and if he attempted to continue walking after its appearance it would develop into a painful, cramp-like feeling in the small of the back which would bring him to an abrupt standstill. After a short rest with support the pain and cramp would fade away entirely. At the time of his first visit to me he could walk about half a mile before the pain became severe. If he walked fast it came on more quickly. He had already undergone various treatments for chronic rheumatism, but without any amelioration of his symptoms, indeed they seemed to have grown worse instead of better.

Examination. November 1, 1910. He is a large, heavily built man, weighing 250 pounds stripped, there having been a steady increase in weight during the last fifteen years. The abdomen is large and pendulous, so that in standing the shoulders are thrown backward and the spine is arched posteriorly in order to maintain the equilibrium, and evidently throwing a considerable strain on the lower portion of the erector spinæ group of muscles. The movements of the spinal column are perfectly flexible in all directions and cause no pain whatever. There is no trace of tenderness on direct pressure over the spine or over the muscles of the lumbar region. Jarring of the spine is equally negative.

The pupillary and tendon reflexes are normal. Indeed, except for a slight tremor of the hands and the mental and physical stigmata of chronic alcoholism, my neurological examination was negative.

The heart sounds were free from murmurs and the pulse was of moderate tension.

The femorals, popliteals, and pedal arteries were palpable. There was not, nor had there been, any swelling or edema of the feet or legs. The urine was free from albumin and sugar.

REMARKS. From the symptoms presented by this patient, I think there can be little doubt but that we are dealing with the very characteristic condition of intermittent claudication manifesting itself in the lower portion of the sacrolumbar mass.

The man never experienced the slightest discomfort while in bed or when sitting. Walking or long-continued standing alone brought on the pain, which was deep-seated and very intense, and was always relieved by support of the spine, which removed the strain from the affected muscles.

The condition had persisted for two years, gradually growing worse in spite of treatment. The spine was perfectly mobile and the painful area was not tender on pressure.

This region receives its arterial blood supply through the lumbar arteries, which are four in number and arise at right angles to the abdominal aorta. Occasionally they take their origin from a common trunk, which subdivides into a right and left lumbar artery. The lumbar arteries then course between the psoas magnus muscle and the vertebral column to the interval between the transverse processes, where a division takes place into a dorsal and an abdominal branch, similar to the divisions of the intercostal arteries.

The dorsal branch gives off immediately after its origin a spinal branch, which enters the spinal canal and is distributed to the spinal cord; it then continues its course backward between the transverse processes and is distributed to the muscles and integument of the back, anastomosing with branches of the adjacent lumbar arteries.

The abdominal branch passes outward behind the quadratus lumborum and is continued between the abdominal muscles, anastomosing with the epigastric and internal mammary arteries in part.

As the symptoms in the case are limited to the lumbosacral region, occasionally extending into the sides, I would attribute them to disease of one or more of the lumbar arteries or to an arteriosclerotic process in the abdominal aorta, which interferes with the free flow of blood through these vessels, so that a sufficient blood supply is received for the physiological processes in the passive state, but which does not suffice for the increased demands

of the sacrolumbar mass during activity, hence the painful cramp and its peculiar intermittent character. I have found no cases recorded of intermittent claudication of the lumbar region, nor have I observed a similar case. It seems to me, however, not improbable that other cases of this same type may occur and have been overlooked or misinterpreted and that some of the lumbar pains and cramps of advanced life may be dependent upon arteriosclerotic processes in the abdominal aorta or its lumbar branches.

ACUTE YELLOW ATROPHY OF THE LIVER IN CHILDREN, WITH REPORT OF A CASE.

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Acute yellow atrophy of the liver is a very rare disease. In fact, Osler[1] states in the third edition of his *Practice of Medicine* that he had never seen a case. Rolleston,[2] in twenty years had seen in the postmortem room or examined the liver of 7 cases. It occurs much less frequently in children than in adults, and for that reason the following case is considered worthy of report.

G. R., a female child, aged five years, was admitted to the children's ward of Lakeside Hospital, November 3, 1909, suffering from intense jaundice associated with stupor. Neither the family nor the personal history threw any light on the case. One week before admission she began to lose her appetite, and vomited several times a day, the last time she vomited being two days before coming to the hospital. During this time the child became more deeply jaundiced, the stools were clay colored, and the urine a deep yellow color. The parents stated that they had not noticed any blood in the vomitus or in the stools. During the last twenty-four hours she had been unconscious.

Physical examination showed a well-developed and quite well-nourished child, tossing about restlessly in bed. The skin and mucous membranes were deeply jaundiced, a small ecchymotic area was noticed in the left lower quadrant of the abdomen, and another on the outer side of the right arm just above the elbow. There were numerous small petechiæ over the lower extremities below the knees. The child was unconscious, but seemed hypersensitive when touched. The pupils were widely dilated and reacted sluggishly to light. The ears, nose, and throat were normal, but

[1] Practice of Medicine, 3d ed.

[2] Diseases of the Liver, Gall-bladder, and Bile-ducts, 1905.

the tongue was heavily coated with a yellowish-white fur. Slight general glandular enlargement was noted. The temperature was 96.2° by rectum, the respirations were 30 to the minute, and somewhat shallow and irregular. Examination of the lungs revealed nothing abnormal. The pulse rate was 64; with the exception of some arrhythmia there was nothing of importance in the examination of the heart. The abdomen was somewhat distended, especially in the lower part, this being due to a full bladder. The spleen could be felt. The lower edge of the liver was not palpable; the upper border of hepatic dulness began at the fourth rib in the right mammary line, and at the sixth rib in the axillary line. The tendon reflexes were exaggerated, and there was some spasticity of the legs. The urine was dark yellow in color; specific gravity, 1017; alkaline, contained a faint trace of albumin, and bile was present in large quantity. The microscopic examination of the centrifugalized sediment showed many epithelial and hyaline casts and many leucin crystals. The leukocyte count was 22,400.

The child vomited shortly after admission to the hospital, the vomitus being mixed with dark clotted blood. The stomach was then washed out and numerous blood clots came away in the washing. The child died two hours later.

Autopsy Report. *Anatomical Diagnosis.* Acute yellow atrophy of the liver, icterus, petechial hemorrhages (skin, omentum, mesentery, mediastinal tissues, epicardium, pleura, lung, Peyer's patches, mucous membrane of the stomach), cloudy swelling of heart, kidney, pancreas, and adrenals, stenosis of the cystic duct, thyroid hyperplasia.

Autopsy was performed nine hours after death. The body was that of a well-formed female child, 95 cm. in length. Postmortem rigidity was slight. There was marked postmortem staining over the dependent parts, with numerous petechial spots on the extremities below the knees. The skin everywhere was markedly icteric, the conjunctivæ bright yellow, the pupils widely dilated and equal. A dark brownish fluid was exuding from both nostrils; the ears were free from discharge. The superficial fat was moderate in amount and bright yellow in color.

The peritoneum was smooth. The fat everywhere, omental, mesenteric, and in appendices epiploicæ, showed numerous hemorrhages varying in size from a pin head to a dime. The hemorrhagic condition in the mesentery was very striking, and seemed to be equally distributed throughout, being most marked toward the attachment to the gut. The liver was small, pale in color, its lower border lying well above the margin of the ribs. The gall-bladder, ducts, and the appendix appeared normal. There was a small amount of free bile-stained fluid in the peritoneal cavity. There was nothing abnormal about the diaphragm.

Both pleural cavities were free from adhesions, and contained

a small amount of bile-stained fluid. Beneath the visceral pleura, numerous small hemorrhagic points were noted; these were also quite numerous in the mediastinal fat and in the fat of the epicardium. The pericardium contained a small amount of bile-stained fluid; there were no adhesions, and no subpericardial hemorrhages. The heart weighed 70 grams. The valves were normal; the endocardium was bile stained, but there were no hemorrhages beneath it.

The right lung weighed 170 grams, crepitant and air containing throughout. The surface was smooth and mottled with small dark red areas. On section throughout the lung substance, varying in size from a pin point to 2 cm. in diameter, were numerous small hemorrhages; the bronchial mucosa was slightly congested. The left lung weighed 160 grams, and showed the same conditions as the right except that the hemorrhagic areas were more numerous. The bronchial lymph glands were not enlarged.

The colon was normal. The ileum showed nothing of note except a hemorrhagic Peyer's patch just above the ileocecal valve. The duodenum showed some congestion just above the papilla of the common bile duct. The bile ducts were normal with the exception of the cystic duct, which was occluded 2 cm. from its origin in the gall-bladder. The walls of the stomach were covered with a large amount of thick mucus, and there were a few small hemorrhages into the mucosa along the greater curvature.

The liver weighed 250 grams, was pale in color, very flabby, and showed some wrinkling of its capsule. It lacked the rigidity of a normal liver, and partially collapsed and bent under its own weight. On section, the lobular markings were indistinct, and showed bright yellow areas 1 to 2 cm. in diameter, mingled with reddish slightly depressed areas. The outlines of the lobules were entirely lost in the red and could only occasionally be discerned in the yellow areas. The gall-bladder contained a small amount of bright yellow mucus, and the walls were slightly congested. The pancreas was normal.

The right kidney weighed 80 grams. The capsule stripped readily, leaving a smooth surface, fetal lobulation was well marked. On section, the cortex was swollen, and showed marked cloudy swelling. The left weighed 75 grams and was similar to the right.

The thymus was normal. The thyroid was slightly enlarged. The trachea and larynx showed no submucous hemorrhages.

The brain weighed 1075 grams. The calvarium showed marked depressions, every convolution of the cerebrum being marked by a corresponding mould in the inner table of the skull. The dura mater showed definite bile staining. The section of the brain showed nothing unusual.

On microscopic examination, the liver showed extensive degeneration. In many sections no trace of liver cells could be seen,

nothing being left but the vascular stroma. In other sections traces of liver cells still remained, but the cells were granular, vacuolated, and stained diffusely; an occasional cell could be seen which stained well, these having a granular vacuolated cytoplasm and a small darkly stained nucleus. There was no evidence anywhere of regeneration of liver cells. In the areas where the degeneration of liver tissue was most marked, the capillaries were distended with blood. Hemorrhages were quite numerous. The interlobular bile ducts showed everywhere a marked proliferation; this was most marked in the areas where the destruction of the liver cells was greatest. Here the lobules were completely surrounded by proliferated connective-tissue of Glisson's capsule in which were numerous newly formed bile ducts. These showed a tendency to spread down into the lobules in places, which was evidently an attempt at regeneration. Glisson's capsule showed a slight round-celled infiltration, and was everywhere thickened, in some places considerably so. The gall-bladder was normal; desquamated epithelial cells filled the lumen of the bile ducts. The heart showed nothing but a considerable grade of cloudy swelling. In the lungs a few small areas of focal hemorrhage were seen. There was nothing else abnormal. The thymus was normal. The thyroid showed a moderate grade of hyperplasia. A moderate degree of cloudy swelling was found in the adrenals. The brain was normal.

Cultures taken from the heart blood gave a pure growth of staphylococcus albus. Sections of the liver stained by the Levaditi method failed to show spirochetes.

In 1894 William Hunter was able to find 250 published cases of acute yellow atrophy of the liver. Four years later McPhedran[3] collected 29 additional cases. In 1903 Best,[4] in an exhaustive study, found about 500 cases reported in the literature. Of these, a small proportion occurred early in life. I have been able to find reports of 40 children with this disease; these including my own patient making a total of 41. In 1905 Rolleston was able to collect 22 cases in the first ten years of life.

One of the earliest cases recorded was that of Politzer,[5] who, in 1858, observed this condition in a newborn infant. On the fourth day after birth the child became ill with jaundice and bloody vomit, which became worse on the following day, and was accompanied by high fever and restlessness with a tendency to stupor. Later the left lobe of the liver showed a perceptible diminution in size. On the eighteenth day the child died, death being preceded by convulsions and bleeding from the umbilicus. The urine showed leucin and tyrosin cyrstals. The liver at autopsy was considerably diminished in size, the diminution chiefly affecting the left lobe. The bile passages were patent and the umbilical veins and arteries

[3] Sajous' Annual, 1899, iv. 393.
[4] Thesis, Univ. of Chicago, 1903.
[5] Jahrb. f. Kinderheilkunde, 1860.

were normal. The microscopic examination of the liver showed a high degree of destruction of the liver cells. The same author, two years later reported a case in a girl baby four months old, who became suddenly ill with diarrhea, vomiting, and fever, the symptoms suggesting a gastro-intestinal catarrh. On the seventh day of the illness, icterus appeared, which became very intense. The stools were free from bile pigment. The liver was enlarged and painful on pressure. This increased liver dulness continued until the twelfth day. On the fourteenth day there was evident diminution in the size of the liver, blood was vomited and passed with the stools. Forty-eight hours later the child died from exhaustion, and by this time no liver dulness could be made out below the costal margin. An autopsy showed that the liver was small and flabby, and microscopically there was great destruction of liver cells, the latter containing a great deal of fat.

The following cases have been reported by various authors: Loeschner,[6] boy, aged three years; Mettenheimer,[7] boy, aged four years; Widerhofer,[8] girl, aged one and three-fourths years; Hecker,[9] newborn girl; Senator,[10] girl, aged eight months; Brandenburg,[11] boy, aged eleven weeks; Hilton-Fagge,[12] boy, aged two and one-half years; Steiner,[13] boy, aged ten years; Monti,[14] boy, aged four years; Pleischl and Falwarczny,[15] boy, aged fourteen years; Mann,[16] boy, aged one and one-fourth years; Aufrecht,[17] newborn child, Dinkler,[18] girl, aged twelve years; Brunton and Tunnicliffe,[19] boy; aged three and one-half years; Foltanek,[20] boy, aged twelve years; Goodhart,[21] boy, aged two and one-half years; Bjelin,[22] child, aged thirteen years; Greves,[23] child, aged one and three-fourths years; Babes,[24] boy, aged six years; Lewitsky and Brodowsky,[25] child, aged fifteen years; Lanz,[26] boy, aged four years; Meder,[27] boy, aged fifteen years; Merkel,[28] boy, aged six years; Poddig,[29] boy, aged two and one-half years; Rehn and Perlo,[30] boy, aged two and one-half years; Rinsema,[31] girl, aged five years; Rosenheim,[32] girl,

[6] Oesterrichische Zeits. f. Kinderheilkunde, 1856. (Abstract, British and Foreign Medico Chirurg. Review, 1860, vol. xxv.
[7] Memorab. aus der Praxis., 1862, vol. vii.
[8] Jahrb. f. Kinderheilkunde, 1859, Band ii, p. 42.
[9] Monatssch. f. Geburtskunde, 1867.
[10] Jahrb. f. Kinderheilkunde, 1865.
[11] Festschrift f. e. Hagenbach-Burckhardt, Basel, Leipzig, 1897, S. 61.
[12] Trans. Path. Soc., London, 1869, xx, 212.
[13] Jahrb. f. Kinderheilkunde, 1871, S. 428.
[14] Archiv f. Kinderheilkunde, Band vii, S. 346.
[15] Zeits. der K. K. Gesell. der arzte zu Wien, 1858.
[16] Amer. Jour. Obstet., 1875, viii, 539.
[17] Zentralbl. f. innere Med., 1896, No. 2.
[18] Inaug. Dissert. Halle, 1887.
[19] St. Barthol. Hosp. Rep., 1896, xxxii, 425.
[20] Quoted by Merkel.
[21] Trans. Path. Soc., London, vol. xxxiii, p. 82.
[22] Quoted by Merkel.
[23] Brit. Med. Jour., 1884, i, 766.
[24] Virchow's Archiv, 1894, No. 136.
[25] Quoted by Merkel.
[26] Wien. klin. Woch., 1896.
[27] Ziegler's Beiträge z. Path. Anat., 1895, Band xvii, S. 143.
[28] Münch. med. Woch., January 30, 1904.
[29] Inaug. Dissert. Königsberg, 1892.
[30] Berl. klin. Woch., 1875, S. 644.
[31] Quoted by Merkel.
[32] Zeits. f. klin. Med., 1889, Band xv.

aged ten years; Heukelon,[33] child aged three months; Starck[34], boy, aged two and one-half years; West,[35] boy, aged six years; Schmidt,[36] boy, aged two and one-fourth years; Todt,[37] girl, aged three and one-yalf years; Carpenter,[38] girl, aged twenty-three months; Rogers,[39] boy, aged four years; Parkinson,[40] boy, aged four years; Wentworth,[41] boy, aged five years; Griffith,[42] boy, aged seven years; Drennan,[43] boy, aged eight years. The proportion of boys and girls afflicted is approximately two to one.

The etiology of acute yellow atrophy of the liver is quite unknown, but it is probably not due to a specific poison, for we find that numerous forms of intoxication, particularly chloroform, phosphorus, syphilis, alcohol, puerperal eclampsia, may lead to a condition closely resembling this disease. I have seen one case of chloroform poisoning in which the symptoms and the course of the disease were indistinguishable from acute yellow atrophy of the liver, and leucin and tyrosin crystals were found in the urine. Inasmuch as there is such a marked resemblance between this disease and phosphorus poisoning, some writers have thought that all cases were due to poisoning with phosphorus, but that is not true, as recent pathological studies have served to differentiate between the two conditions. Wells[44] has summarized the chief differences between phosphorus poisoning and acute yellow atrophy as follows: "Phosphorus produces a general injurious effect upon all the organs of the body, the liver merely showing the most marked anatomical changes, which at first consist of fatty metamorphosis of the liver, due to a migration of the body fat from the fat deposits into the injured cells, subsequently the liver cells disintegrate, the cytoplasm being affected before the nucleus, and the liver may become smaller than normal, although it is usually enlarged because of the fat deposition. Typical acute yellow atrophy is characterized by an early necrosis of a large proportion of the liver cells, the nucleus becoming unstainable while the cytoplasm is still little altered in appearance, and fatty changes play a subordinate role or are absent. As Auschutz says, "The poison seems to strike at the life of the cell, its nucleus, while phosphorus attacks the cytoplasm. Furthermore, the poison of yellow atrophy seems to be very specific, for it attacks the other organs of the body almost not at all, and within the liver it affects only the hepatic cells proper, while the bile duct

[33] Nederl. Tijdschr. v. Geneesk., 1888.
[34] Jahrb. f. Heilkunde, 1898.
[35] Trans. Path. Soc., London, 1880, xxxi, 116.
[36] Inaug. Dissert. Kiel, 1897.
[37] Akute gelbe Leberatrophie im kindlichen Lebensalter, Berlin, 1903, p. 32.
[38] Reports of Soc. for Study of Disease in Children, London, v, 133, 134.
[39] Reports of Soc. for Diseases in Children, 1906, vi, 294.
[40] Report of Soc. for Study of Disease in Children, London, 1906, vi, 229.
[41] Archives of Pediatrics, February, 1906, p. 81.
[42] Archives of Pediatrics, February, 1906, p. 88.
[43] Jour. of Path. and Bact., July, 1911, p. 141.
[44] Chemical Pathology, 1907.

epithelium and stroma cells are so little injured that they are able to proliferate greatly, this proliferation being a prominent feature." Wells further considers that the atrophy is due to an autolysis of necrotic liver cells by their own enzymes, and that in the most typical cases of acute yellow atrophy we have to do with a poison having a very specific effect on the liver cells, which destroys their synthetic activities without injuring their intracellular proteolytic enzymes, and consequently autolysis occurs. The fact that so many cases are preceded by symptoms of gastro-intestinal disturbance would lead us to suppose that this poison was of intestinal origin. Quincke considered that possibly regurgitation of pancreatic juice up the bile ducts might be responsible for the degenerative condition in the liver, but this is not true, for the bile pressure is greater than that of the pancreatic juice, and the bile ducts and peripheral portions of the lobules are always least affected. Klebs, Eppinger, and others have ascribed a bacterial origin to this disease, basing their conclusions on the finding of bacteria in the bile ducts and liver detritus in fatal cases. The bacteria in these cases were probably secondary invaders. In a case reported by Aufrecht, the disease in a newborn infant was associated with a sclerema neonatorum.

Acute yellow atrophy may occur in chronic drunkards, the condition supervening on existing cirrhosis. It may also occur in secondary syphilis. In a case reported by Merkel, though the child showed no signs of syphilis, the father had a syphilitic spastic paralysis of the lower extremities, and the mother had had repeated abortions. The disease is commonest between the ages of twenty and thirty in adults, females being more often attacked than males, in the proportion of 2 to 1, in contrast to the condition we see in children, where males are more frequently affected.

The majority of cases run their course in two weeks. Occasional cases occur in which the disease is spread over many weeks or months. In general we can divide the symptoms into two stages. The first, which lasts five or six days or sometimes much longer, is characterized by malaise, often muscular pains, nausea, vomiting and occasionally diarrhea, at other times constipation. The jaundice appears during the latter part of this stage. Often the jaundice is the first sign, increasing steadily in its intensity. Cases of acute yellow atrophy have been described in which no jaundice was present.

The second stage is marked by the pronounced grave change in the patient's condition, and especially by the appearance of nervous symptoms, severe headache, intolerance of light, restlessness, delirium, twitching of the muscles, convulsions, coma. In this stage transient paralyses sometimes occur, so that, excluding the jaundice, the clinical manifestations may closely resemble meningitis.

With the onset of the second stage the vomiting becomes more severe and the vomitus often contains blood. The tongue is dry, brown, and tremulous, and the teeth covered with sordes. The pulse is rapid and of low tension. The respirations are often quite irregular. The temperature is often elevated; in other cases it is depressed, rising just before death. Often petechiæ and hemorrhages are found beneath the skin, and blood may be passed in the stools and urine. Epistaxis occasionally occurs. The liver at first may be increased in size, but, as a rule, the liver dulness is much diminished before death, this diminution being partly due to the change in size of the organ and partly to its flabbiness, allowing it to fall away from the abdominal wall, the coils of intestine taking its place. The spleen is sometimes enlarged. The urine contains a great deal of bile and, as a rule, albumin and casts. It is remarkable that glycosuria is not observed. The urea is diminished, but the percentage of nitrogen present as ammonia is increased. Leucin and tyrosin are nearly always present, sometimes one being present in the urine without the other. There is nothing distinctive about the blood. Leukocytosis is nearly always present, and in a few cases colon bacilli have been found by blood cultures. The coagulability of the blood is decreased.

Morbid Anatomy. The liver is always greatly diminished in size, often weighing only one-half to one-third of the normal weight. The liver is more or less universally affected, but often the left lobe shows the most marked atrophy, as in the first case reported by Politzer. In the chronic cases where the disease has existed for months the surface of the liver, instead of being smooth, is nodular, due to a compensatory hyperplasia of the liver cells, comparable to the adenomata seen in cirrhosis. The capsule is wrinkled and loose, and small hemorrhages may be seen beneath it. The liver is flabby, so that it bends readily under its own weight. Its surface is greenish yellow in color, with here and there reddish areas. It cuts with resistance. The cut surface is a bright lemon-yellow color, with numerous patches of darker brownish red, the latter predominating in the left lobe, where the greatest atrophy is seen. The yellow areas are soft and slightly swollen, the reddish areas are tough and of a leathery consistency. Histologically the change in the yellow areas are seen to be more recent, the parenchymatous cells showing extensive fatty changes, the fat droplets being within the nucleus, as well as within the cytoplasm. In the red areas, absorption of the fatty material has taken place, and we see mainly a network of capillaries, within the meshes of which are degenerated liver cells and the detritus of broken-down liver cells, masses of chromatin, and blood. When death has been delayed, evidence of regeneration can be seen in the form of patches of newly-formed liver cells, with deeply staining nuclei, some of them exhibiting mitoses. Pseudo-bile capillaries may also be present in con-

siderable number. Crystals of leucin and tyrosin may be seen in fresh sections, and the amount of fat which can be extracted from the liver is about 5 per cent. above the normal. The gall-bladder contains bile mixed with a great deal of mucus, and the bile ducts are normal.

The kidneys and heart show evidences of cloudy swelling, and the spleen is softened and enlarged.

The gastro-intestinal tract usually shows evidences of catarrhal inflammation. There is often some ascites.

Petechial hemorrhages may be found beneath the pleura and pericardium, and in the intestinal mucosa, and sometimes extensive cerebral and meningeal hemorrhages occur.

The diagnosis is usually simple from the intense jaundice, the nervous symptoms, the atrophy of the liver and the finding of leucin and tyrosin crystals in the urine. The latter are sometimes seen in other conditions of the liver, where there are marked degenerative changes. Sometimes these cases are confused with cases of phosphorus poisoning, but a careful history will serve to distinguish the latter. Hilton-Fagge has recorded a case in a boy, aged two and one-half years, where the symptoms were incorrectly thought to be due to belladonna poisoning.

Acute yellow atrophy of the liver is almost uniformly fatal. A few cases of undoubted recovery have been recorded. In 1897 Wickham Legg gave a list of 28 reported cases of recovery.

There is no treatment of much avail. Free purgation, intravenous or subcutaneous transfusion with saline solution, and intestinal antisepsis have been recommended.

TREATMENT OF NOCTURNAL ENURESIS IN CHILDREN.

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Nocturnal incontinence of urine in children is one of the common and one of the most troublesome conditions which the physician is called upon to treat. It is perhaps for this reason that it is so commonly neglected both by the profession and by the laity. The physician after one or two therapeutic ventures dismisses the case with the suggestion that the adenoids should be removed, or, if it is a boy, that he be circumcised, and then if these suggestions are carried out and a cure does not result the family of the child become resigned to what they regard as inevitable.

If we exclude at the outset those cases in which there is evi-

dence of mental deficiency and those caused by congenital malformations, we have a group of cases which were formerly regarded as "essential" or idiopathic enuresis. As our knowledge of the subject has increased, the idiopathic cases have gradually diminished in number, and Bazy aptly remarked that essential enuresis means essential ignorance.

Enuresis is a symptom, and the underlying cause should be diligently sought. From the articles on the subject one gathers that many authors have theories which their statistics prove to be correct, and one is reminded of the blind men and the elephant.

In the first place, some of the children who suffer from enuresis have imperfect or undeveloped spinal cords. The diagnosis in these cases can only be suspected, but perhaps the main test is that these are the cases which resist treatment and which persist throughout life. Some of the individuals may show other signs of physical degeneracy, some do not.

Frankl-Hochwart has noted the fact that many adults suffering from neurasthenia give the history of enuresis in childhood.

Certain cases are apparently of an epileptoid character and Pfister[1] believes that those cases in which enuresis first manifests itself after five years of age, and in which the symptom is not constant but comes on at intervals, belong to this class.

Many children with enuresis suffer from an overirritable nervous system, and this may account for small lesions causing the urine to be passed through reflex irritability. In other cases the irritating lesion is marked and would affect the nervous system of the normal child.

Vulvitis and vaginitis in girls and urethritis and balanitis in boys are among the most common reflex causes of enuresis. The seat of the irritation may be in the rectum, and a polypus, fissure, or ulcer may be the unsuspected cause, or perhaps much more frequently infection with the oxyuris. Calculi, tuberculosis of the bladder, and vesical polypi may be mentioned as some of the causes. Hypertrophy of the bladder has also been met with. The drinking of too much fluid, especially in the evening, or the habitual eating of salty or other food causing thirst should be borne in mind.

Bed wetting may result from mere laziness, and in other instances a child may sleep so soundly that the warning of the distended bladder is unheeded.

Another cause is abnormal muscle tone, and Merklen[2] considers enuresis an element of weak motor inhibition.

In 1893, Freund[3] mentioned the fact that in about one-half of the sufferers from incontinence of urine there existed a hyper-

[1] Monatsschrift f. Psychologie u. Neurologie, 1905, xv, 113.
[2] Bulletins de Société de Pediatrie de Paris, June, 1909, p. 339.
[3] Neurologische Zentralbl., November 1, 1893.

tonia of the muscles of the legs, and he therefore attributed the increased micturition to an exaggeration of the vesical tone. This conception of the disease has never met with any great recognition by clinicians. In order to get some information concerning the condition, Merklen studied 164 children between the ages of three and fifteen years in various stages of intellectual development, but the number did not include any idiots. In 116 the muscles were normal, and in 48 they were weak. The 116 normal children included only 8 who suffered from enuresis, while the 48 weak ones included 18, or a proportion of 6.8 per cent., as compared with 37 per cent. In the 26 children who had enuresis the ages varied from four to fourteen years. Looking at the problem from this standpoint, 69 per cent. showed motor weakness of the muscles.

Merklen calls attention to the fact that in these children cataleptoid attitudes are more frequent than among normal children.

It has long been known that children with adenoids are liable to suffer from enuresis. Fisher operated on 716 cases, and of these, 106, or 14.8 per cent., had enuresis. Mygin in 400 cases found 31 cases, or 7.75 per cent. Gruback in 427 cases found 61 with enuresis, or 14.28 per cent. On the other hand, Lilang examined 50 children with enuresis, and found only 8 who had adenoids. He operated on these and only cured one.

Allaria[4] reported 22 cases, of which 8 were cured, 3 improved, 9 not improved, and 2 cured spontaneously. Of the 8 cases which were not cured, 1 had a rectal papilloma, 3 showed signs of mental degeneration, and these sometimes had incontinence of the feces due to a weak sphincter.

Kapsaun reported 35 cases, all cures, and in a second series of 20 cases 15 were cured and 5 improved, and Cautas in 15 cases cured 13, and the remaining 2 were improved. These latter statistics are so favorable that one is inclined to believe that there must be some error in them.

Williams has written several articles on the subject of enuresis, and he has found a certain class of cases which may briefly be described as follows:

These children suffer with subnormal temperature, with a usual range of from 96.2° to 97.2° F., and in some cases the temperature is even lower than this. They complain of being cold, even though they may be somewhat overclothed, and they often have what is popularly spoken of as "dead fingers"—that is, one or more fingers become blanched and very cold when the child is exposed to cold and often at other times. These children feel cold even in summer, and suffer more at night than during the day. They are also undersized and under weight. About one-

[4] Gazetta degli Ospedali et delle Cliniche, April 27, 1909, p. 529.

half the cases have adenoids, but the nasal respiration is perfectly free. The high arched palate is present in all these cases, and Williams believes that all these things taken together indicate a thyroid insufficiency.

It is generally admitted that one of the functions of the thyroid secretion is to fix the calcium salts in the tissues, and that without a sufficient amount of secretion the salts cannot be utilized and bone formation is defective and the child fails to grow normally. He believes that the change in the shape of the bones is due to the fact that the bones are softer, without sufficient calcium salts, and so are more easily affected by pressure. Williams believes that the factor that decides the difference between the results of thyroid insufficiency in adults and the same insufficiency in children is the fact that the needs for the salts of calcium at the two periods of life are widely different.

Hertoghe[5] has called attention to certain cases of myxedema fruste in childhood, in which nocturnal enuresis was mentioned as one of the symptoms. In this connection it is interesting to note that Léopold Lévi and H. de Rothschild have called attention to another sign of thyroid insufficiency, which they call the eyebrow sign (signe de sourcil). It consists in the lessening in the amount of the outer third of the eyebrow and sometimes in complete absence of this. Whenever this sign exists other evidence of thyroid inadequacy should be sought. It should, however, be borne in mind that perfectly developed eyebrows may be seen in individuals who have a high degree of thyroid insufficiency, and that in other instances the eyebrow may be deficient with a normal thyroid. This sign is of particular advantage in that it is easily observed.

Hamonic[6] has studied the question of the relation of phimosis and incontinence of the urine, and he believes that a long adherent prepuce is a factor in causing it. He has performed 187 circumcisions for the exclusive purpose of curing this condition. Of these 130 were cured, 47 of which were relieved within from two to twenty-five days, and 83 after six weeks. Fifty-seven of the cases were lost sight of. In some instances there was a history of enuresis in the family. He believes that, both in boys and girls, genital irritation plays an important role in nocturnal incontinence.

The following table shows rather imperfectly the causes of nocturnal enuresis:

[5] Bulletin de l'Académie de Médecine de Belgique, IV Series, tome xxi, No. 4.
[6] Revue clinique d'Andrologie et de Gynécologie, 1909–10, p. 1.

- Physiological
  - Taking too much fluid.
- Eliminative
  - Due to faulty metabolism.
  - Eating too much salt, etc.
  - Due to drugs.
- Urine
  - Hyperacidity.
  - Alkalinity.
  - Bacteriuria.
- Genito-urinary organs
  - Inflammations
    - Urethritis.
    - Cystitis.
    - Pyelitis.
  - Malformations.
  - Calculi.
  - Tumors or polypi.
  - Hypertrophy.
- Nervous system
  - Hypertonia or irritability of bladder.
  - Weakness of sphincter.
  - Reflex
    - Balanitis.
    - Vulvovaginitis.
    - Anal fissure.
    - Rectal polypi.
    - Intestinal parasites.
  - Malformation of spinal cord.
  - General irritability.
- General
  - Diabetes mellitus.
  - Diabetes insipidus.
  - Rachitis.
  - Thyroid insufficiency.
  - Enlarged adenoids and tonsils.

In a similar way the suggestions for treatment may be tabulated, but no pretence is made to include all of the things that have been suggested.

- Restriction of fluids.
- Diet.
- Protection from cold.
- Rest and quiet life.
- Postural treatment.
- Waking child to empty bladder.
- Suggestion not to urinate.
- Suggestion to call out in sleep that there is a desire to urinate.
- Moral hygiene in lazy children.
- Reflex irritation
  - Passing catheter or sound.
  - Galvanic current.
  - Galvanic cautery.
  - Faradic current.
  - Injections of nitrate of silver solution.
  - Injections of normal salt solutions, etc.
  - Epidural injections (Cathelin).
  - Retrorectal (Jaboulay).
  - Perineal (Cahier).
- Drugs
  - Atropine sulphate.
  - Strychnine sulphate.
  - Bromides.
  - Ergot.
  - Hexamethylenamine.
  - Desiccated thyroids.

Among the more interesting of the newer suggestions as to treatment are the results which have been obtained by Williams.[7] He has published two series of cases which he has treated by the use of the desiccated thyroid. McCready has also written upon this subject. Williams' cases all belong to the class described above, and he obtained wonderfully satisfactory results in all except one case, and it is interesting to note that in this case the child did not have a subnormal temperature. Williams administered one-half grain of the dried thyroid twice daily to children who were between two and six years of age, and this amount may be increased somewhat for older children. The increase in dosage should be made slowly, as directly opposite effects are occasionally induced by overdosage. The results as described by Williams in his own words were exceedingly dramatic.

I have had occasion to use this method in a small series of cases, and these were not picked cases, as were evidently the cases in the series which Williams reports. In a small proportion of cases in which there were more or less marked signs that might be attributed to thyroid insufficiency, the results were quite remarkable. These were all children with adenoids and enlarged tonsils, or in some cases children in whom the adenoids and tonsils had been recently removed. In my series of cases the effect was obtained promptly or not at all. In every instance in which a favorable result was obtained a marked difference was noticed after the administration of one or two doses of the drug, and in all cases within a week.

Another remarkable observation which coincided with the result obtained by Williams, is that the undersized children gained weight rapidly. Williams mentioned one patient that gained five pounds in a week, and another, two pounds and seven ounces in a week. However, most of the patients gained less rapidly.

Another curious thing, which Williams has not mentioned, is that it has not been necessary to continue the thyroid over long periods of time, although in this regard I may have been accidentally fortunate and relapse in some cases may probably be looked for.

In several instances in which the children had high, arched palates but no subnormal temperature, the thyroids had no effect whatever.

Of the other methods of treatment with the newer remedies one may mention briefly the following:

Attention has been called to the use of hypnotism in the treatment of nocturnal enuresis by Voisin.[8] He has reported one interesting case, in a boy, aged between thirteen and fourteen years.

[7] Brit. Jour. Child. Dis., June, 1909. Lancet, 1909, i, 1245; Polyclin., London, 1909, xiii, 61.
[8] Revue de l'Hypnotisme et de la Psychologie Physiologique, 1908–09, xxiii, 247.

In this patient the urine was sometimes passed without dreams, and at other times was accompanied by dreaming of the act. After several trials, Voisin was able to put the boy into hypnotic sleep, and on the following suggestion, that he would not dream any more, obtained a disappearance of the incontinence for six days. He was hypnotized again and the same suggestion made, which lasted for three days. He then made an epidural injection of artificial serum on three different occasions, and continued to hypnotize him once a week for a month. The patient has been entirely well for over a year. Voisin raises the question as to what the action of the epidural injection was in this case, whether the therapeutic effect was due to its action on the cauda equina, or whether it acted by suggestion. One is inclined to believe that the latter is the proper explanation. Among the rose-colored statistics are those of Culler, who treated 64 cases with hypnotism and claims to have cured 50 and bettered 10.

Genouville[9] has made an interesting communication to the Association François d'Urologie on a simple device which he has used with considerable success in certain cases. It probably acts as a sort of suggestion without words. He states that the idea of the apparatus is not original with him, but he has forgotten where he saw the mention of it. It consists of placing in the bed of the child under the region of the pelvis two metal plaques separated by a piece of flannel or a piece of absorbent cotton. These two metal plaques are connected with wires, each to one pole of a battery and a bell. When the infant urinates the cotton becomes wet, completes the circuit and causes the bell to ring. The infant is awakened and the micturition is stopped, and after being thus awakened several times, the patient is frequently cured. This has only been tried in a comparatively few cases by the inventor. A remarkable thing in connection with it is that most of the cases that were cured were cured very promptly. A modification of the device consists in having the apparatus arranged to give a slight electric shock on the abdomen of the child.

The use of the injection of salt solution has also been suggested. Cathelin has suggested making the injection directly into the spinal canal by means of lumbar puncture, or, in other instances, subcutaneously in the sacral region. Jaboulay has suggested retrorectal injections of 100 to 150 grams of salt solution, and Cahier[10] has suggested subcutaneous injections into the perineum. He used between 60 and 70 grams, making the injections 1 or 2 cm. on either side of the median line. He claims to have had especially good results in the treatment of the adult cases.

Lozano and Forès[11] have used the epidural method with suc-

[9] Revue Prat. d. Mal. d. Org. gén.-urin., 1909–10, vi, 59.
[10] Arch. de med. et pharm. mil, 1909, liii, 401.
[11] La Clinica Moderna, April, 1911.

cess, injecting the solution into the spinal canal, making the injections low down in the sacral region toward the bottom of the canal. Whether the results obtained by these injection methods are purely to be attributed to the mental effect, or whether they act reflexly, one cannot say. In refractory cases this method might be tried.

Of the old-fashioned means of treating this disease there are one or two things which may be mentioned. The first is to place the child upon a simple non-irritating diet and to restrict the amount of fluid taken, particularly the amount of fluid taken after four or five in the afternoon. Secondly, in some cases raising the foot of the bed so that the irritable neck of the bladder is not quickly affected by the first urine which enters the bladder. Certain cases are improved by a large amount of rest and leading a quiet life. General reflex irritability may be caused by too strenuous a life, particularly long automobile rides and the like. I have seen on several occasions the simple directions to have the child stay in bed until it is ready to get up in the morning, and to lead a quiet life generally, result in cure.

In hospital practice a large proportion of the cases can be improved by a more or less dry diet and restriction of fluids. Where there is no other indication for treatment I have found the use of atropine to give better results in a greater number of cases than any other one thing in the suggestions made. To be of any service atropine must be given in full doses. In nocturnal cases a dose at five o'clock and at bedtime is all that is required. In cases occurring both during the day and night, the administration of the drug every three hours is to be advised. I usually prescribe a solution containing 1 grain of atropine sulphate in 2 ounces of water. Each drop of this represents approximately $\frac{1}{1000}$ of a grain, and ordinarily about as many drops will be required at a dose as the child is years old; but this is not the proper method of ascertaining the dose. Starting with one or two drops each dose should be increased one drop at a time until flushing of the face and neck occurs some twenty minutes after the administration of the drug. The dose should be diminished one drop, and this amount continued until the child has ceased urinating at night and for at least two weeks later, when the drug may be left off gradually, diminishing a drop at a time until one drop is reached, when it may be stopped.

It is hardly necessary to comment upon all the things mentioned in the table above. The chief object in writing this paper was to call attention to some of the things which have been published recently, and to call attention to the fact that there exists a small class of cases in which the thyroid insufficiency evidently causes nocturnal enuresis and which may be cured by the administration of the thyroid with great benefit to the general health and growth of the child.

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Sieber. Ueber die Behandlung der Enuresis nocturna mittels epiduraler Injektionen nebst experimentellen Versuchen über die Aetiologie dieser Erkrankung, Ztschr. f. gynäk. Urol., Leipzig, 1909, i, 213.

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SOME APPLICATIONS OF THE CREHORE MICROGRAPH, WITH ESPECIAL REFERENCE TO THE RECORDING OF HEART SOUNDS.

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(From the Department of Research Medicine, University of Pennsylvania.)

The purpose of this communication is to make a preliminary report of a few methods of using the Crehore micrograph[1] in the

[1] Jour. Exper. Med., 1911, xiii, 616; ibid., xiv, 339 to 365, and 520.

study of the physiology of the cardiovascular system in man and in animals.

Holowinsky[2] was the first to use the principle of light interference rings for the study of the function of the heart, but he used it only for the recording of heart sounds. His instrument is somewhat similar to the Crehore micrograph. He transmitted the sound vibrations electrically from a rather complex transmitter, placed on the chest wall, through an induction coil to an electromagnet actuating a diaphragm to which was attached a mirror in close apposition with a fixed glass plate, as in the Crehore micrograph. As a source of illumination he employed a magnesium light.

Crehore has constructed his instrument for taking two simultaneous photographic records, not, however, of heart sounds, but of the movements of the heart or pulse. He applies a suitable tambour to each of the two sites from which he desires to take tracings, for example, from the apex and from the radial. Each tambour is connected by rubber tubing with one of the interference instruments, which consists of a metal tambour the upper surface of which is formed by a thin brass diaphragm to the centre of which is fastened with colophonium a small mirror, while just above this mirror a glass lens is held stationary. The impulse from the apex beat or pulse is transmitted by the closed column of air through the tubing to the interference instrument where it produces movements of the metal diaphragm and, therefore, of the small mirror. The changes in distance separating the small mirror from the fixed lens above it cause the movements of the light interference rings produced by the rays from a mercury vapor lamp, these rings being photographed through a slit on a moving film.

In working with the Crehore micrograph we have found it necessary to make the following modifications and additions: (1) A time marker; (2) an electromagnetic signal; (3) a modification to permit the taking of more than two simultaneous pulse tracings; (4) an apparatus for taking tracings from the exposed mammalian heart; (5) an adaptation of the micrograph to the recording of heart sounds.

The methods we have used to meet these several deficiencies in the instrument are as follows:

1. *Time Marker.* Crehore estimates time intervals on the film by determining the average speed of the motor propelling the film, before taking each record, and calculating from this the number of inches per second of movement of the film. This method is, of course, accurate only when the film travels at a perfectly even rate, and this we have found not always to be the case. It was, therefore, considered advisable to introduce some more accu-

[2] Arch. d. physiol. norm. et patholog., 5 Sér., vii, 893; Zeitschr. f. klin. Med., 1901, xlii, 186.

rate form of time measurement. To accomplish this, a tuning fork, electrically activated, and set for twentieths of a second, was attached to the floor close to, but not touching, the micrograph. From its movable end a small cord was stretched to a fixed point on the opposite side of the micrograph in such a way that the cord extended just above, and close to, one of the interference instruments. The cord is placed so that it runs approximately perpendicular to the slit of the camera. When so arranged the vibrating cord causes a distinct sinuous shadow on the moving film, each complete wave representing one-twentieth of a second. This time curve is shown at the bottom of Fig. 1.

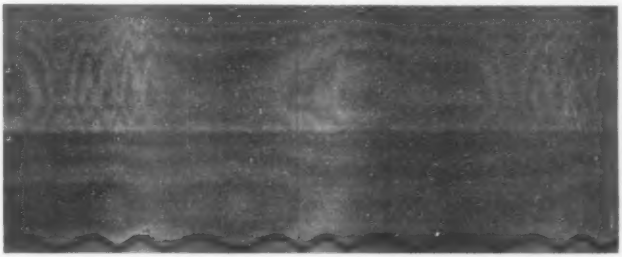

FIG. 1.—Record from right ventricle and jugular of dog. Time curve at bottom—twentieths of a second.

2. *Signal.* The introduction of an electromagnetic signal was accomplished by placing the lever of such a signal just above, almost touching, one of the interference instruments so that its shadow also was thrown through the slit on to the film.

3. *Simultaneous Tracings.* The levers of Marey or other delicate tambours similarly placed permitted the recording of additional pulse tracings or of any other graphic tracings. We have thus taken on one film five simultaneous tracings; the apex tracing on an interference instrument, the radial tracing on the other interference instrument, the carotid tracing with a Marey tambour, a time curve with the tuning fork, and the record of an electromagnetic signal. The ability to take simultaneous tracings from three or more sites has proved often of the greatest assistance in our studies.

4. *Tracing from Exposed Heart.* In taking tracings from the exposed heart it was found that the amplitude of the cardiac movement was so great that the impulse taken directly through a pneumatic tambour held against the heart had too great an amplitude for the sensitive interference instrument. Some method had, therefore, to be devised for reducing this amplitude without altering the character of the curve. It was also desired to localize the tracing to one part of the heart; a tambour held against the

heart gave the movements not only of that part of the heart, but also the changes in position of the heart as a whole. In order therefore, to reduce the amplitude of the pulsation and especially in order to localize the tracing to one part of the heart, we use a modification of the Cushny myocardiograph. This is shown in Fig. 2. It consists simply of the ordinary myocardiograph to which a tambour is attached that can be so placed that the upper end of the movable lever of the myocardiograph shall impinge constantly against the rubber dam, transmitting all its movements to the dam. By raising or lowering the fulcrum of this lever any desired amplitude of movement at its upper end may be secured. The tambour may be connected by tubing, either with one of the interference instruments, or with a Marey tambour, the lever of which is placed to throw its shadow onto the film. This instrument secures both the localization of the tracing to any particular part of the heart, and also the necessary reduction of the impulse amplitude, without, however, impeding the cardiac movement. For securing tracings from exposed vessels we use either a small funnel covered with rubber dam, to the centre of which a small piece of cork is attached, this cork being pressed gently against the isolated vessel, or we introduce a short glass cannula into the vessel, the cannula being filled with saturated magnesium sulphate solution and the end of the cannula away from the vessel being closed with rubber dam. Over this end of the cannula and the dam another rubber tube is drawn containing air, and this, in turn, connected with one of the interference instruments, transmits the movements of the dam to the latter.

5. *Recording of Heart Sounds.* For the recording of heart sounds we first considered the use of telephonic transmission, as in the Holowinsky instrument, but concluded that the record would be freer from adventitious waves if we could secure direct pneumatic transmission. This we have succeeded in doing by making the Crehore interference instrument more sensitive in the following way. One of the interference instruments was taken apart and its metal diaphragm removed. In its place the hard rubber diaphragm from a Bowles stethoscope was substituted, this having been cut to fit the interference instrument. The small mirror was then attached to the centre of this hard rubber diaphragm with colophonium just as it had been attached to the metal diaphragm. The stationary lens was replaced and the adjustment of the rings conducted in the usual manner. The interference instrument thus produced is at least five times as sensitive as the original instrument, and when properly connected with the heart brings out very distinctly the sound vibrations produced by the heart. It is not, however, so sensitive as to be disturbed by the ordinary vibrations of the room. The method of connecting it with the chest is as follows: The instrument is

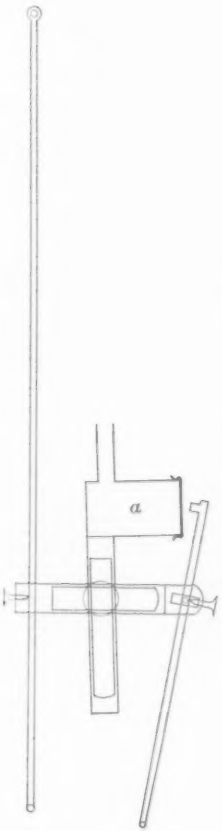

FIG. 2.—Modified Cushny myocardiograph (reduced one-half). *a*, tambour.

FIG. 3.—Photographic record of normal human heart sounds (*A*) apex tracing (*B*), and time curve (*C*). Tracing represents one cycle.

connected by thick-walled rubber tubing of 3 mm. inside diameter with the chest piece of a Bowles stethoscope. In the course of the tubing one of the air valves belonging to the micrograph is placed. When the chest piece of the stethoscope is applied to the precordium and this air valve left slightly open, the gross shock of the apex beat is not transmitted, while the more rapid vibrations causing the sounds are well transmitted to the interference instrument. The accompanying photograph (Fig. 3), shows such a record, with a simultaneous record of the apex beat recorded from the other unmodified interference instrument by Crehore's method (Fig. 4).

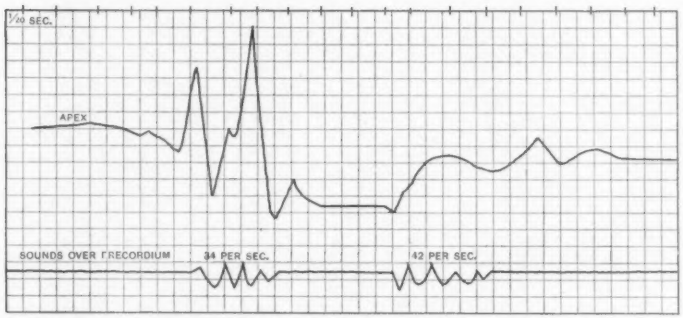

FIG. 4.—Curve plotted from Fig. 3.

Incidentally, it may be mentioned that a mirror fastened at an angle of 45 degrees above the ground glass of the micrograph, enabling the operator while on the floor adjusting the rings to watch, by reflection, the ground glass image of the rings, is a small addition of great service.

These applications to the Crehore micrograph of various forms of physiological apparatus have been found of value in the study of various problems concerning the physiology of the heart and circulation; the results of these studies will be presented in a later communication.

SARCOMA OF THE TONGUE AND CONDITIONS WHICH SIMULATE IT.

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PRIMARY sarcoma of the tongue is a lesion peculiar not only for its rarity but on account of the difficulty in diagnosis in many cases. When the tumor is pedunculated the various forms of

chronic inflammation need not be considered; still, the differential diagnosis between sarcoma and granulation tissue may present some difficulty. If the sarcoma is of a diffuse form the difficulties in distinguishing it from the lesions of syphilis, tuberculosis, macroglossia, and chronic glossitis are so great that both clinically and pathologically various observers may often express a different opinion. Under these circumstances it has seemed justifiable to report in connection with cases of sarcoma of the tongue a diffuse enlargement of part of the tongue which may have been sarcoma, although the bulk of the evidence, both clinical and microscopic, is rather against this diagnosis. There are many points of similarity between this case and some of the others reported as sarcoma by different writers which make it seem probable that a more exhaustive study of their cases might have altered the diagnosis of sarcoma; for example, in Cases XXIV and XLVI.

The patient whose malady led to the study of this subject first consulted me at the New York Skin and Cancer Hospital, July 14, 1910. He was then aged forty-five years, of previous good health, married, and the father of two healthy children. He had always led a temperate life, and his first serious illness was a rectal abscess in January, 1901. This was incised and drained, but did not heal. It was three times operated upon in the succeeding three years, and so far healed that in the last five years it had occasioned the patient no other difficulty than a slight mucous discharge. A proctoscopic examination made by Dr. Mayo, in June, 1910, showed no lesion of the mucous membrane, but an indurated rectum with a tendency to stricture formation.

About 1906 the patient's mouth became tender, the lips, cheeks, roof of the mouth, and gums swelling. In December, 1909, portions of the lips and cheeks were cut away, and in July, 1910, the tongue was twice cauterized.

Although the patient gave no syphilitic history and had never had early symptoms of syphilis, his disease had more than once been diagnosticated as of this character, and three times he was given a thorough course of antisyphilitic remedies without any beneficial result. Local applications were equally inefficient.

When the tongue was examined it was seen to be moderately swollen, especially the anterior half on the left side. Back of this on the left margin of the tongue was a scar from previous cauterization, the edges of which were somewhat swollen and tender. There were no irregularities of the teeth which might irritate the tongue. The lips showed scars of previous operations and were somewhat inelastic.

Under cocaine, November 9, 1910, assisted by Dr. Bainbridge, the scar was excised and a large wedge-shaped piece was removed from the dorsum of the tongue, on the left side, both wounds being sutured. Primary union resulted.

Examination of the blood at this time showed 5,000,000 red cells and 9000 white; the differential count being polynuclears, 57.2 per cent.; lymphocytes, 37 per cent.; eosinophiles, 3.4 per cent.; and transitionals, 2.4 per cent.

FIG. 1.—Tumor of the tongue simulating sarcoma.

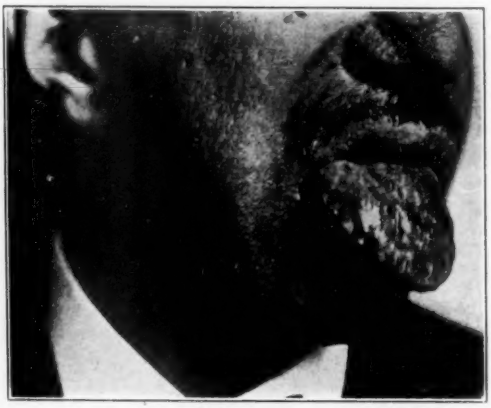

FIG. 2.—Tumor of the tongue simulating sarcoma.

December 9, 1910, a Wassermann test was made with a negative result and the blood was carefully searched for spirochetæ, but none were found.

The tongue continued to increase in size, and changes previously

existing only on the left side spread to the right, so that at the time the photographs (Figs. 1 and 2) were taken, approximately the anterior third of the tongue was involved, the lesion extending farther back on the left than the right. The mucous membrane was unbroken. The affected anterior part of the tongue was slightly darker and slightly denser than the normal posterior part, the line between the two being fairly definite. The affected portion was elevated one-third of an inch or more above the normal portion. Indentations caused by pressure of the teeth are plainly shown in the photographs. Later, shallow pressure ulcers developed in these indentations and the tongue increased so in size that it was retained in the mouth with some difficulty. There was a constant drooling of saliva. The mucous membrane of the hard palate now showed alteration, in places being thicker than normal and thrown into unnaturally deep folds. The lymphatic glands under both sides of the lower jaw were enlarged.

Dr. Coley, who saw the patient in consultation, considered the disease macroglossia of the chronic inflammatory type.

On January 26, 1911, I amputated about one inch of the tongue, extending the excision farther back in the central portion so that the wound could be sutured. It healed primarily.

Four pathologists who examined the excised portions gave the following reports:

Dr. Ewing: "Macroglossia from chronic myositis and secondary plasma-cell infiltration of the tissue."

Dr. Fordyce: "The condition may be a sarcoma, but I should hardly feel inclined to commit myself definitely to this diagnosis."

Dr. Jessup: "It seems possible to rule out carcinoma, sarcoma, and syphilis, and in the absence of giant cells, tubercle tissue, and bacilli there is slight ground for the diagnosis of tuberculosis. The cells of the growth have the appearance of plasma cells, and pathologists who have seen the sections say that the appearance resembles that seen in cases they had considered tuberculous. For lack of a better name the term plasmona might be employed."

Dr. Jeffries: "A small, round-celled sarcoma."

The accompanying microphotographs (Figs. 3 and 4) show very clearly the type of microscopic picture obtained with the high and low power lenses. They were essentially the same in all portions of the diseased tongue.

In February and March, 1911, the patient had fourteen injections of the mixed toxins of prodigiosus and erysipelas. At first, these seemed to check the growth, but later this continued and the injections were abandoned. In April, 1911, the patient was given a full dose of salvarsan without benefit.

Injections of pyoktanin, which had proved so satisfactory in Case XXIV, reported below, were next employed. In that case a preliminary tracheotomy was performed as a safeguard against

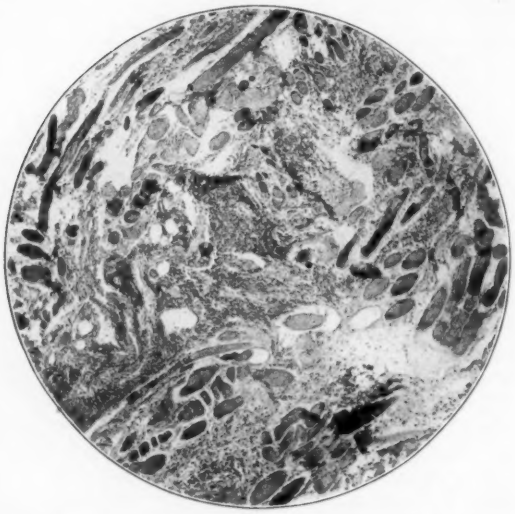

FIG. 3.—Microphotograph made under Dr. Ewing's direction, showing appearance of specimen under the low power. The separation of the bands of muscle fiber is plainly shown.

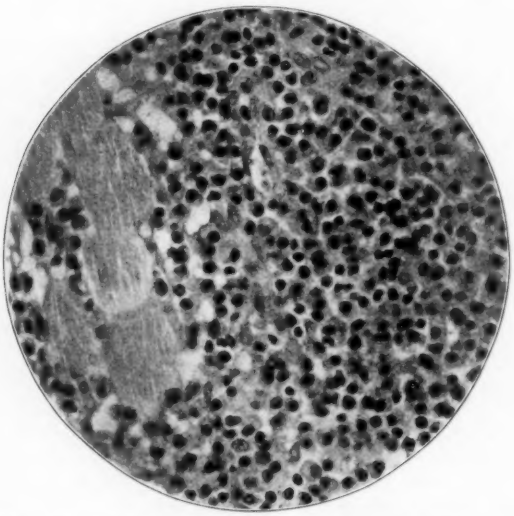

FIG. 4.—Section of tongue shown under high power. Photograph from preparation made by Dr. Jessup, showing the plasma cells and the broad band of degenerated muscle fiber.

possible sudden swelling of the tongue following the injections. The anticipated swelling did not occur. As the swelling in my patient's tongue had not yet reached its posterior part, it seemed perfectly safe to begin with small amounts of pyoktanin without a preliminary tracheotomy. By the time he had received three injections the swelling of the tongue was so much increased that they were abandoned. Thus far, nothing but operations had given any relief. The tongue continued to swell, and on May 19, 1911, in company with Dr. Gerster, I again amputated the anterior portion of the tongue; this time so far back that the remainder of the organ when at rest did not extend forward beyond the molar teeth, although it could be pushed forward nearly to the incisors. The resulting wounds healed chiefly by granulation. When healing was complete and the tongue had shaped itself to the floor of the mouth, it reached, when at rest, to the base of the incisor teeth. In the succeeding months it showed no tendency to increase in size except on the right margin just in front of the tonsil. This superfluous tissue was cut away under cocaine, and that part has since remained quiet. Following this operation, the swelling of the lymph glands under the jaw disappeared.

In August, 1911, the patient developed a cough. An examination of the sputum showed it to contain tubercle bacilli. In spite of anything I could say, the patient refused to apply to any physician for suitable treatment nor would he furnish sputum for another microscopic test. When last heard from, November 8, 1911, he still insisted that his trouble was not tuberculous, although his cough had not left him. The tongue was a little tender, but showed no return of the long-standing disease.

When we turn to medical literature to review what has been written upon sarcoma of the tongue, we find reports of nearly 50 cases. From the data given it is well nigh impossible to make any satisfactory classification in these cases. Some previous writers have attempted to divide them into cases of true sarcoma and those of the doubtful character. Such a classification would be instructive if it was reliable; but neither the histories nor the clinical appearances, nor the pathological reports, nor statements as to the outcome, are sufficiently full or uniform to warrant such a classification. It seems better therefore, merely to number the cases chronologically, giving the reference of each, for the sake of those who wish to further investigate the subject.

The tumor was said to be pedicled in 7 of the 48 recorded cases. In a few other cases it is spoken of as globular, but this might or might not imply the existence of a distinct pedicle. In some cases the tumor is described as distinctly firmer than the rest of the tongue. In others, it is stated that, even when ulceration was present, it was as soft as the normal tongue.

The descriptions of the gross appearances of these tumors show

clearly how ridiculous it is to describe such things by comparing them with objects in nature. Those who do this usually make the mistake of comparing a growth to an object much larger than it really is. Thus when one speaks of a tumor "as large as an orange" existing in the dorsum of the tongue, inaccuracy is evident, for the mouth will not contain even a very small orange. Another writer speaks of removing two tumors, one as large as a hen's egg and the other as large as a walnut. This, again, is a physical impossibility. "As large as a nut" may mean anything from a beech nut to a cocoanut, and the very indefiniteness of the comparison destroys its value. A "bean" is another vegetable product which varies greatly in size. A "fives ball" is a near relative of the well-known tennis ball, but it must be a very much shrunken relative to find accommodation in the left side of the tongue. With two good standards of measurement at our disposal, viz., inches and centimeters, it is unfortunate that such inaccuracies of description should be found in scientific reports.

Ulceration is not an early or common symptom. It is mentioned in only 11 cases, and in 3 of these the ulcers were shallow and apparently due to pressure against the teeth when the mouth was overfull. Such ulcers occurred in my patient, but speedily healed when operation reduced the bulk of the tongue and removed pressure. The excavating hard ulcer so characteristic of carcinoma is rare in sarcoma of the tongue. The cases in which it occurred are Case IV, probably a carcinoma; Cases IX and XLVIII, lymphosarcomata; Case XI, in which the ulcer followed incision into a cyst containing calcareous matter. In Cases XIX and XLVII ulcers were present apparently without induration, and the tumors were respectively round-celled and spindle-celled sarcoma. In 16 cases, ulceration or its absence is not mentioned. From the description of the operation in some of these cases ulceration was surely absent; but granting its presence in some of the others, it must still be classed as a very rare symptom of sarcoma except as a result of traumatism, such as incision or constant pressure against the teeth when the tumor has overfilled the mouth.

Another point of importance in diagnosis is the presence of enlarged glands. Such glands are mentioned at the time of the first operation in 13 cases. Their absence is noted in 15 cases. In 9 cases they appeared subsequent to the first operation, although in 4 of these cases there were no glands present at the time of the first operation.

There were some striking recoveries with freedom from recurrence for long periods of time. Recurrences with the death of the patient are mentioned in 6 cases, but in 3 others extensive post-operative recurrences were present at the time of the report. In 21 cases no recurrence was present at the time of the report, although

in some of these the period that elapsed between the last operation and the report was only a few months. There were also some striking recoveries after extensive involvement either of the tongue or of tongue and lymph glands as well. For example, in Case XVIII a spindle-celled sarcoma involved the right half of the tongue beyond the median line; there were no glands at the first operation; the tumor recurred locally, and involved the left submaxillary lymph glands, necessitating the second operation. Still further recurrence was removed by a third operation, thirteen months after the first, and two years later there was no sign of recurrence. In Case XXI, there is no mention of glands being involved. An extensive removal of the tongue and floor of the mouth was twice performed, with an interval of nineteen months between operations. A year after the second operation there was no recurrence. In Cases X and XLI glands were involved and were removed at the first operation. There was no sign of recurrence for periods varying from eight months to several years. Case XLVIII presents a still more remarkable record in that glands were present and removed at the time of the first operation. At a later operation other glands showing metastases were removed, and five years after the second operation the patient was free from recurrence. In Case XXX, removal of part of the tongue and involved lymph glands was three times performed at intervals of one month each. Following the last operation, recurrence again developed, grew for a month, and then without further operation this disappeared, leaving no trace in seven months. In Case XLIV, there were no glands present at the time of the first operation. The patient died eleven months later and was found to have extensive involvement of the abdomen, looked upon as metastases from the primary tumor of the tongue.

From the character of these reports it is impossible to draw satisfactory conclusions as to the mortality following operation or the probability of recurrence.

Case I.—Fiedler.[1] Male, aged forty years, a teacher. For eighteen years he suffered from hoarseness, especially in winter; for six years from a cough, and for two months from difficulty in swallowing. A broad tumor at base of tongue was just visible when mouth was wide open. Portions of tumor, one "as large as a hen's egg" and another "as large as a walnut" were removed with the galvanocautery. Spindle-celled sarcoma.

Rapid local recurrence with involvement of the tonsils and cervical lymph glands. Two months after first operation masses weighing $1\frac{1}{4}$ ounces removed with galvanocautery. Patient died two months later after almost choking for some days. Mass measured 7 cm. across, 8 cm. lengthwise, and 2 cm. high.

[1] Zeitschr. f. Med. Chir. u. Geburts., 1864, n. f. iii, p. 305

CASE II.—Lücke.[2] Male, aged thirty-six years, had a tumor slowly growing for seven years, the size of a walnut. The tumor was shelled out of a distinct capsule. Examination showed oval and round cells, many hyaline degenerated; centre of tumor calcified; considered a cholesteatoma. No recurrence.

CASE III.—Jacobi.[3] Male, aged three months, had a congenital, rapidly growing tumor on dorsum of tongue; not pedicled; size of walnut. No ulcer. No enlarged glands. Excision by galvanocautery. Spindle-celled sarcoma. Two weeks later wound granulating.

CASE IV.—Heath.[4] Male, aged sixty years, suffered for six months with a painful ulcerating tumor of under surface of tongue. Sharply circumscribed more to the left than the right and involving the floor of the mouth. One enlarged gland beneath the jaw. Excision of tumor after division of jaw. "Medullary cancer." (Cited by Marion and others as a round-celled sarcoma.) No recurrence in eight months. The swelling in the lymph gland had disappeared.

CASE V.—Hueter.[5] Female, adult, noticed at fifth month of pregnancy a swelling of the dorsum of the tongue, which grew rapidly; two months later it was the size of a hazel nut. Excision of tumor. Sarcoma. Subsequent history not given.

CASE VI.—Albert.[6] Female, aged fifty-six years. For one year she had pain on swallowing; for some months a tumor widely attached to base of tongue obscured the pharynx. It was sharply differentiated from the substance of the tongue. Excision of tongue and tumor close to hyoid bone. Round-celled sarcoma. Death from pneumonia in eight days.

CASE VII.—Hutchinson.[7] Male, aged twenty-two years, had a painless growth for twelve years or more, which finally filled the mouth and embarrassed speech, breathing, and swallowing. No ulceration or enlarged glands. Removal after division of symphysis of jaw and tracheotomy. Sarcoma or lymphosarcoma. Weight, 7 ounces. Good health for two years, then rapid recurrence in scar and death.

CASE VIII.—Santesson[8] (Operator, Berg). Male, aged thirty-one years, had a swelling in tongue three years, chiefly in right half. Severe hemorrhages from several small ulcers. Enlarged lymph glands had existed for fifteen years, possibly scrofulous. Palpation showed a hard tumor covered by thinned mucous membrane. Tracheotomy; excision of lymph glands of right side; ligation of right lingual; excision of tongue. Plexiform sarcoma with hyaline degeneration. Death in seven days from sepsis.

[2] Jahr. v. Virchow-Hirsch, 1866, i, 173.
[3] Amer. Jour. Obstet., 1869, ii, 81.
[4] Trans. Path. Soc., London, 1869, xx, 157.
[5] Berl. klin. Woch., 1869, p. 346.
[6] Wien. med. Presse, 1885, p. 171.
[7] Lancet, 1885, i, 1084.
[8] Nord. med. Arkiv., 1887, vol. xix, No. 18, p. 1, and Zentralbl. f. Chir., 1889, p. 506.

CASE IX.—Beregszaszy.[9] Male, aged forty-two years. For two months he noticed a growth at base of the tongue, with pain and ulcer; also glandular enlargement. No treatment. Death in eight days from metastasis in peritoneum. Growth in tongue considered the original lesion. Pathological report, lympho-sarcoma.

CASE X.—Butlin.[10] Male, aged forty years, a smoker; free from syphilis; for two months had a tumor of the left side of the tongue the size of a "fives ball." No ulcer. Hard submaxillary gland. Left half of tongue and glands removed. Small round-celled sarcoma. No recurrence in several years.

CASE XI.—Godlee.[11] Female, aged twenty-four years; noticed for five weeks sore spots on under surface of tongue near the tip, developing into a tumor. It was diagnosticated as abscess and punctured. It contained calcareous matter, and wound was drained. In a few weeks ulcer was excised. Prompt recovery. Adenosarcoma. Cysts, some of them filled with calcareous material, were surrounded by tissue thought to be sarcomatous, composed of round and spindle cells. Subsequent history not given.

CASE XII.—Mandillon.[12] Female, aged twenty years. From this patient a tumor the size of a pea near the frenum of the tongue was removed with the thermocautery. It recurred in three months, and was excised and the wound cauterized. No microscopic examination. Considered sarcoma. Second recurrence in a few months locally, but larger than before.

CASE XIII.—Bleything.[13] In a male, aged seventeen years, cigarette smoking and a broken tooth were thought to have caused a painful elevated nodule on right border of tongue near the tip with an indurated base. No enlarged glands. Excision and cauterization failed to effect a cure. Later, excision of a triangular portion of tongue containing the lesion. Round-celled sarcoma, or possibly granulation tissue. No recurrence in six years.

CASE XIV.—Mercier[14] (Operator, Mercanton). Male, aged thirty-six years, had for eight years a pedicled tumor, the size of a nut, on the dorsum of the tongue in median line, growing slowly, without pain. No ulceration. No enlarged glands. Tumor excised with a portion of the tongue at its base. Wound sutured. Primary union. Sarcoma with giant cells. Fatty degeneration in the centre of the tumor. Subsequent history not given.

CASE XV.—Targett[15] (Operator, Durham). In a male, aged two years, a tumor was noticed for seven weeks rapidly growing

[9] Krankheiten d. Zunge von Butlin, 1887, p. 226.
[10] Lancet, 1887, i, 623, and Diseases of the Tongue, 1900, p. 301.
[11] Trans. Path. Soc., London, 1887, xxxviii, 346.
[12] Jour. de Méd. de Bordeaux, 1888, xviii, p. 189.
[13] New York Med. Jour., 1888, xlvii, 683.
[14] Rev. Méd. de la Suisse rom., 1890, p. 250.
[15] Guy's Hosp. Rep., 1890, p. 24.

without pain. Tumor one inch in diameter of dorsum of tongue; one and one-half inches behind tip. No ulcer. No enlarged glands. Observation for two months, then removal with ecraseur. Rapid local recurrence so that in a fortnight it was larger than before operation. Mixed celled sarcoma. Death in a few weeks.

Case XVI.—Targett[16] (Operator, Howse). A male, aged sixty-five years, noticed for one year a painless, globular swelling most prominent on under surface of tongue and deeply connected with a similar swelling in the floor of the mouth on the left side. No ulcer. Enlarged gland below the jaw. Anterior two-thirds of left half of tongue removed, together with mass in floor of mouth. Round-celled sarcoma. Fifteen months later large recurrence in left side of neck and another in the right cheek. No recurrence in mouth. Two years after operation, patient still in poor health, tumor masses constantly growing; mouth still free.

Case XVII.—Mikulicz.[17] Female, aged twenty-four years, noticed for three months a small nodule on dorsum of tongue growing without pain. Bleeding only when injured by teeth. Pedicled nodular tumor, 1.5 cm. in diameter, about 1 cm. from tip of tongue. Pedicle one-third the diameter of tumor. Excision of tumor with thermocautery, the cut being made through the base of the pedicle. Sarcoma. Subsequent history not given.

Case XVIII.—Mikulicz.[18] Male, aged fifty-seven years, had for six months a gradually increasing swelling of right half of tongue reaching beyond the median line. No pain nor ulcer. No enlarged glands. Removal of tongue to a point back of the disease. Spindle-celled sarcoma. Local recurrence and involvement of left submaxillary lymph gland required other operations seven and thirteen months after the first. Two years after the third operation there was no sign of recurrence.

Case XIX.—Scheier[19] (Operator, Körte). Male, aged twenty-eight years, suffered for six months pain and swelling of tongue; followed by deep ulceration well back on the dorsum behind circumvallate papillæ. Antisyphilitic remedies without effect. Growth soft in spite of deep ulceration. One enlarged gland. Preliminary tracheotomy: Division of lower jaw back of first molar; removal of tumor and most of base of tongue; cauterization of surface of wound; suture of divided jaw. Small round-celled sarcoma. Rapid recurrence filling the floor of the mouth in six weeks and only partly overcome by a second operation. Death in eleven months from enormous growths of both sides of neck.

[16] Guy's Hosp. Rep., 1890, p. 21.

[17] Mickulicz und Michelson, Atlas d. Krankheiten d. Mund u. Rachenhöhle, 1892, No. 2, Pl. 35.

[18] Ibid., 1892, No. 3, Pl. 37.

[19] Berl. klin. Woch., 1892, p. 584.

CASE XX.—Stern.[20] Female, aged four years, an idiot; had a tumor of right margin of tongue, well back, the size of a filbert. Excision of tumor. Spindle-celled sarcoma. Recurrence locally in seventeen months, led to second excision of tumor with wider margin of tongue. Subsequent history not given.

CASE XXI.—Schultèn.[21] Female, aged thirty-two years, had difficulty in swallowing for five months on account of a tumor at base of tongue almost filling throat. Tonsils and epiglottis not involved. Growth projected below chin. Tracheotomy; ligation of both linguals; pharyngotomy; extirpation of root of tongue and tumor. Weight, 92 grams. Sarcoma. Nineteen months later extensive recurrence in floor of mouth and remains of tongue. Tracheotomy; extensive removal of tumor and tongue. Complete healing in four months. Patient well a year after second operation.

CASE XXII.—Onodi.[22] Female, aged seventeen years, for six months noticed a tumor as large as a bean at the right side of the base of the tongue. It grew without pain to the size of a small nut, still covered by normal mucous membrane. Section removed for examination. Fibrosarcoma. Removal of tumor proposed and refused. One month later condition about the same. Ulcer caused by the removal of section was still unhealed.

CASE XXIII.—McBurney.[23] Male, aged thirty-six years, had had several applications of the galvano-cautery for discomfort in the throat. From a tumor over two inches by one inch, which occupied the back of right half of tongue, a section was removed and proved sarcomatous. Preliminary tracheotomy. Through incision below the jaw the right half of the tongue, right half of epiglottis, a part of the right wall of the pharynx, and right tonsil were excised. Wound partly sutured. Good recovery. Swallowing perfect. In three months recurrence in the submaxillary region was widely excised and skin grafted. Two years later no further recurrence.

CASE XXIV.—Perman.[24] Female, aged thirty years, had for six months an unpleasant feeling in the throat, with occasional streaks of blood. Examination revealed a tumor at base of tongue about 1.5 to 2 cm. in diameter. No ulceration. Density about the same as the rest of the tongue. Iodide of potash given without result. Section removed for examination proved to be sarcoma. Removal of tongue refused. Preliminary tracheotomy and pyoktanin injections, 1 or 2 grams of a 1 to 500 solution, every other day. No swelling of tongue. Tumor much reduced by five injections; disappeared after thirty-one injections and two applications of the galvanocautery. Ten months later no recurrence.

CASE XXV.—Abbe.[25] Male, aged seventeen years, for some months noticed a mass in dorsum of tongue about one inch in

[20] Deut. med. Woch., 1892, p. 495.
[21] Deut. Zeit. f. Chir., 1893, xxxv, 417.
[22] Rev. de Laryngol., etc., 1893, p. 886.
[23] Med. Rec., 1893, xliii, 439.
[24] Hygiea (Stockholm), 1894, p. 367, and Buffalo Med. and Surg. Jour., xxxiv, 148.
[25] Annals of Surgery, 1894, xx, 72.

diameter. No ulcer. Removal of tumor with capsule, suture of wound. Angiosarcoma (Hartley); pure sarcoma (Eliot and Fergusson). No recurrence in nine years.

CASE XXVI.—Dunham[26] (Operator, Bryant). In a male, aged sixty-one years, a bite of the tongue was followed in eight months by formation of a tumor in the right margin about one inch from tip; globular; discrete; about one inch in diameter. No ulcer. Excision of tumor. Sarcoma, composed mostly of large round cells. Subsequent history not given.

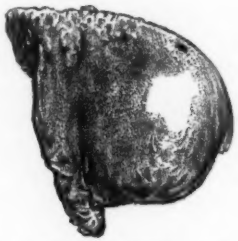

FIG. 5.—Sarcoma of tongue. (Dunham.)

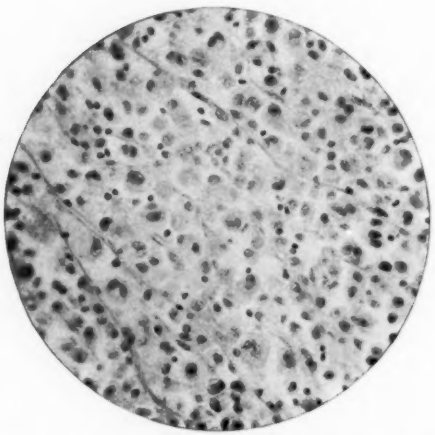

FIG. 6.—Photomicrograph of sarcoma of tongue composed mostly of large round cells. (Dunham.)

CASE XXVII.—Murray.[27] A woman aged fifty-six years. History of removal of a cyst under tongue five years previous and a small hard tumor from floor of mouth five months previous. Examination showed a firm tumor of right side of floor of mouth

[26] AMER. JOUR. MED. SCI., 1895, cx, 259.

[27] Annals of Surgery, 1895, xxii, 271.

and tongue with enlarged glands beneath jaw. No ulceration. Whole tongue and mass beneath removed in one piece after tracheotomy. Round the spindle celled sarcoma. One year later no recurrence. This tumor probably started in the floor of the mouth.

CASE XXVIII.—Perkins.[28] Male, aged twenty-six years, had a tumor of dorsum of tongue growing since four years of age, but the last year rapidly. No pain. No ulcer. No enlarged glands. Excision three-quarters tongue. "A slow malignant tumor consisting principally of small round cells, among which are a number of isolated connective tissue fibers" (McFarland). Twenty months later recurrence in floor of mouth and small glands in both submaxillary regions. Further operation refused. Outcome not known.

CASE XXIX.—Marion[29] (Operator, Poncet). In a male, aged thirty-two years, with no apparent cause, the left half of tongue swelled so suddenly as to embarrass swallowing, speech, and respiration. An incision evacuated foul pus, the swelling partly subsided, and the wound healed, leaving the left half of the tongue larger than the right. It grew slowly for six years, then more rapidly for two years, until speech and swallowing were again difficult. Examination showed a large mass beneath the tongue pushing downward so as to appear above the hyoid right and left. No ulcers. No enlarged glands.

After division of the inferior maxilla in the median line the tumor was removed from its capsule with some parts of the mucous membrane, but little of the muscle of the tongue. Sarcoma with much elastic tissue. Weight, 400 grams. Four years later, no recurrence.

CASE XXX.—Marion[30] (Operator, Berger). Male, aged seventeen years, stated that for six months the left side of the tongue was often bitten. For two months he had noticed a slowly growing tumor. A tumor the size of a small nut in the left border of the tongue, 3 cm. from the tip, pedicled, and having shallow ulcerations. Small glands in each submaxillary region. Section removed and pronounced spindle-celled sarcoma. Tumor excised with wide margin of healthy tissue. One month later local recurrence. Glands larger than before. Removal of glands both sides of neck and partial excision of tongue; after ligation of the left lingual artery. One month later local recurrence. Division of the inferior maxilla and removal of left half of tongue. One month later local recurrence, which grew rapidly for one month, then slowly disappeared. In seven months no trace remained.

[28] Ann. Surg., 1896, xxiii, 585.
[29] Rev. de Chir., 1897, xvii, 682.
[30] Ibid., 1897, xvii, 677.

CASE XXXI.—Lichtwitz.[31] Female, aged twenty-five years, noticed for six weeks a pedicled tumor size of "nut" on dorsum of tongue 2 cm. from the tip and slightly to the left of the median line. No ulcer. Excision of tumor with its base by electrocautery. Tumor, 9 mm. in diameter, is an angiosarcoma. Two years later, no recurrence.

CASE XXXII.—Littlewood.[32] Male, aged seventeen years, scalded his tongue. Ulcer never healed. Mercury and potassium iodide three months without benefit. Two years later centre of tongue had enlarged to size of "orange." Two small ulcerations. Excision of tongue and three weeks later of glands on both sides of neck. Round-celled sarcoma—infiltrating. Growths appeared subsequently in left tonsil, both sides of neck, and right temporal muscle. Death in five months.

CASE XXXIII.—Delbanco[33] (Operator, M. Schmidt). An infant, aged fourteen days, presented a diffuse congenital tumor of the left border of the tongue in its anterior part. Excision of tumor. Diffuse sarcoma, chiefly spindle celled. Secondary degeneration of muscle fibers. Result not given.

CASE XXXIV.—Melchior-Robert[34] (Operator, Villeneuve). Female, aged sixty-four years, suffered for three months pain in right side of tongue especially on swallowing. Had bad teeth extracted, and later noticed a spherical tumor the size of large nut attached by a pedicle to right side of tongue 3 or 4 cm. (1½ inches) from its tip. Superficial ulcerations were present. Tumor excised with V-shaped piece of tongue. Wound cauterized and sutured. Six days later a profuse hemorrhage; then wound healed. Round- and spindle-celled sarcoma. No sign of recurrence two and one-half years later.

CASE XXXV.—Downie[35] (Operator, MacEwen). Male, aged twenty-three years, thought a fishbone became fixed in the back of the tongue. Discomfort for four months, with difficulty in swallowing and loss of weight. Repeated examinations failed to show any foreign body. The right half of the tongue was swollen chiefly toward its base, also the right tonsil. Shallow pressure ulcers from teeth. Section removed for examination. The whole tongue and neighboring structures removed. Round-celled sarcoma. Result not given.

CASE XXXVI.—Downie.[36] In a male, aged thirty-four years, without apparent cause, there was bleeding from the mouth for several weeks with rapid loss of weight. There was then noticed a pedunculated tumor, size of a walnut, springing from the left side of the base of the tongue behind the circumvallate papillæ.

[31] Gaz. heb. des Sci. Med., 1898, xix, 199.
[32] Lancet, 1898, i, 507.
[33] Münch. med. Woch., 1898, xlv, 155.
[34] Rev. de Chir., 1899, xvii, 546.
[35] Brit. Med. Jour., 1899, ii, 1065.
[36] Brit. Med. Jour., 1899, ii, 1065.

Tumor excised after division of the left cheek back to the masseter muscle. Wounds healed primarily. Spindle-celled sarcoma, weighing 28 grams (about one ounce). Patient rapidly recovered normal weight. Four months after operation no sign of recurrence.

CASE XXXVII.—Butlin[37] (Operator, Barling). In a female, aged thirty-five years, there developed in four months an elastic swelling limited to left half of tongue, noticeable on both upper and under surfaces. No ulcer. No enlarged glands. Left half of tongue removed, including an encapsulated tumor which was the size of a horse chestnut. Round-celled sarcoma. No recurrence in three and one-half years.

CASE XXXVIII.—Naegele.[38] In a child, aged three months, a tumor growing since birth in the lower portion of tongue pushed the tongue up and back. No ulceration. Section of tumor removed. Round- and spindle-celled sarcoma. Death from pneumonia in six days. Autopsy showed a diffuse sarcoma displacing the muscle fibers. No glands involved nor other metastases.

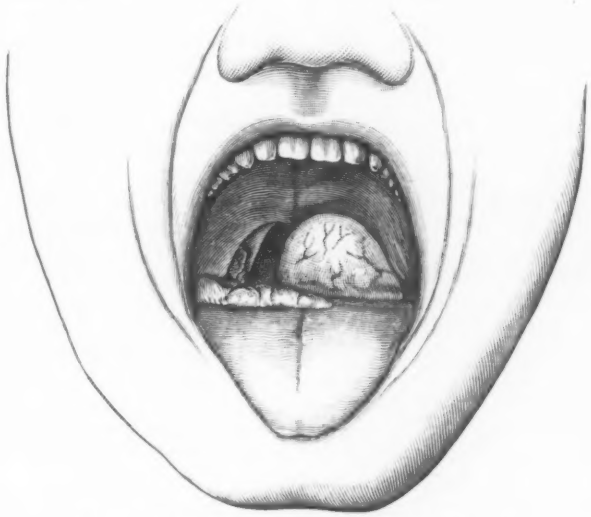

FIG. 7.—Spindle-celled sarcoma of the tongue. (Shambaugh.)

CASE XXXIX.—Shambaugh.[39] Male, aged thirty-eight years, could not give any cause for gradually increasing pain and swelling of tongue with marked emaciation during eight months. Tumor the size of a small hen's egg on the left side of the base of the tongue,

[37] Diseases of the Tongue, 1900, p. 302.
[38] Inaug. Dis., Kiel, 1900.
[39] AMER. JOUR. MED. SCI., 1902, cxxiii, 115.

completely filling the left side of the pharynx. Bled easily when touched. A small, firmer tumor occupied the right side of the base of the tongue as far forward as the papillæ. No ulceration. No enlarged glands. Soon after this an enormous hemorrhage nearly caused the patient's death. The large tumor was somewhat shrivelled; section removed showed a spindle-celled sarcoma.

CASE XL.—Fripp and Swan.[40] Male, aged twenty-six years, without history of syphilis or injury, developed a tumor in upper and posterior part of tongue with enlarged submaxillary glands. Iodides given without benefit and swallowing and breathing became difficult, so that in three months tracheotomy was performed. Two months later a smooth, firm, non-ulcerating tumor filled almost the whole pharynx. There was a large mass of lymphatic glands between the jaw and thyroid. Part of tongue containing tumor and mass of glands removed in one piece, September, 1899. Tumor measured 7 by 5 cm. Spindle celled sarcoma. Recurrence first noted in eighteen months. Operation for recurrence in tongue only two years after first operation. Six months later no sign of recurrence.

CASE XLI.—Chanu.[41] Female, aged forty-two years, suf- suffered without known cause for eight months from a painful tumor infiltrating the right side of tongue behind the circumvallate papillæ Speech normal. Swallowing very difficult. No ulcer. Small movable painless glands palpable on both sides of neck. Removal of glands and ligation of lingual artery on left side of neck. Removal of glands and ligation of external carotid and branches right side of neck. Incision into pharynx and excision of part of base of tongue with tumor. Suture. Sarcoma of tongue and lymphatic glands; cells mostly small and round, a few racquet-shaped. Patient recovered perfectly. No sign of recurrence in nine months.

CASE XLII.—Fisk.[42] Male, aged seventy-one years, without syphilitic history, bit his tongue. In ten months the right half of tongue grew until he could not close his mouth. No ulcer. No enlarged glands. Great pain. Cachexia marked. Excision of tumor, September 17, 1902. Small round-celled sarcoma. Two months later no recurrence.

CASE XLIII.—Matrisimone.[43] Female, aged fifty-five years, presented a tumor of right margin of tongue, which was several times excised, but recurred rapidly. Myxosarcoma from connective tissue; muscular bands not affected. Subsequent history not given.

[40] Guy's Hosp. Rep., 1902. lvii, 88.
[41] Thèse de Paris, 1903, No. 302.
[42] Annals of Surgery, 1903, xxxvii, 373.
[43] Policlinico Ser. Chirurg., 1903, No. 11, and Zentralbl. f. Chir., 1904, p. 604.

CASE XLIV.—Keenan.[44] Male, aged forty-seven years, noticed for three months slight pain and fulness at base of tongue, and later a firm globular tumor, 1.5 cm. in diameter, well back on dorsum of tongue to right of median line. No ulcer. No enlarged glands. Sections removed showed growth to be a small, round-celled sarcoma. Operation refused, but one month later performed elsewhere, the tumor being excised. Some weeks later a mass in the abdomen was noticed, which ultimately involved the stomach, duodenum, and pancreas and caused the patient's death in eleven months from his first symptoms. Abdominal tumor was of the same nature as that in tongue.

CASE XLV.—Cheatle.[45] Female, aged fifty-two years, noticed for six weeks a tumor right side tongue half-way back; no enlarged glands. Encapsulated tumor excised. Spindle-celled sarcoma. Recovery from operation. Subsequent history not given.

CASE XLVI.—Wiggin.[46] Female, aged twenty-three years, noticed for seven years a small nodule at back of tongue. A doctor pulled it off and cauterized the wound. Prompt recurrence of tumor on left side of tongue about one and one-half inches long. Tumor shelled out of capsule November, 1905. It was examined by four pathologists with following result: "Fibroma, benign" (Krumwiede); "fibroma, benign" (Dunham); "fibrosarcoma, only slightly malignant" (Jeffries); "fibroma, may recur locally" (Welch). Nine separate tumors shelled out from right side of tongue February, 1906; and a diffuse growth removed from scar on right side of tongue April, 1906. The results of pathological examination were: "Fibroma" (Krumwiede); "sarcomatous element in tumor" (Dunham); "sarcoma" (Jeffries); "fibroma, possibly rhabdomyoma" (Welch). Rapid recurrence after last operation. Trypsin treatment gave temporary relief, then continued growth.

I had an opportunity to examine this patient in January, 1912, and found the tongue practically normal, without evidence of tumor and scarcely a scar.

CASE XLVII.—Serafini.[47] Female, aged thirty-four years, noticed a tumor of the border of the tongue since she was twelve years old. It developed in the wound caused by a sliver of lead. A small tumor remained stationary for twenty-two years. Then began to grow. Ulcerating tumor easily bleeding; an enlarged gland in the submaxillary region. Excision of the tumor. Spindle-celled sarcoma of the interstitial type.

CASE XLVIII.—Schleinzer.[48] Female, aged fifty-four years, experienced rather sudden pain and difficulty in swallowing, followed in two weeks by copious expectoration and very bad breath. Ulcer with sharp edges on right margin of tongue. Enlarged glands

[44] Ann. of Surg., 1904, xxxix, 956.
[45] Jour. Amer. Med. Assoc., 1906, xlvii, 2003.
[46] Deut. Zeit. f. Chir., 1911, cix, 283.
[46] Med. Press and Cir., 1906, ii, 14.
[47] Rev. de Chir., 1909, xl, 242.

right side of neck. Extensive removal after temporary division of lower jaw. Lymphosarcoma. Later removal of gland from left side of neck showing metastasis. In five years no recurrence.

CASE XLIX.—Author's case described in the beginning of this article. Last operation May, 1911. Patient reports no evidence of recurrence January, 1912.

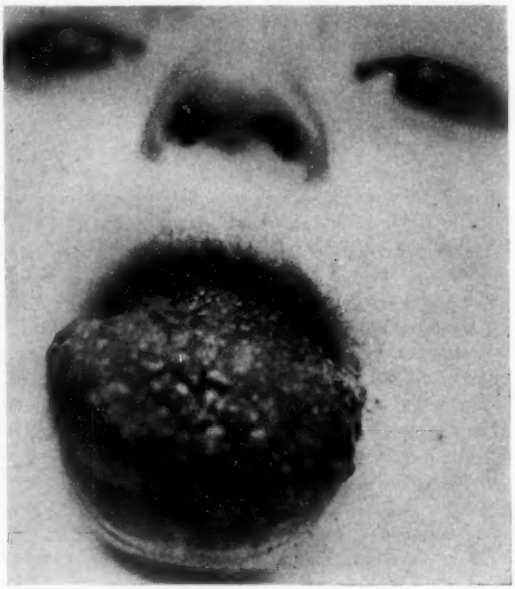

FIG. 8.—Macroglossia (Comroe).

For the sake of comparison a brief abstract of the case recently reported by Comroe of macroglossia of the lymphatic type is here given.

Comroe[49] (Operator, Harrison). Female, aged three years, a child of healthy parents, was observed at birth to have a very large tongue, which increased rapidly after the first year, developing great papillæ and taking on a bluish color. After two years of age, fissures appeared and there were several hemorrhages, one of alarming character. The posterior half of the tongue appeared quite normal; the lips were swollen and excoriated, and pressed forward by the tongue, the mass of which prevented the incisor teeth from touching when the molars were closed.

[49] Cleveland Med. Jour., September, 1911, p. 743.

A section was removed for examination and found to be lymphangioma. "There was a marked overgrowth of connective tissue with profuse infiltration of white cells in the form of lymphoid tissue."

The anterior portion of the tongue was excised. Four months later the tongue was essentially normal, and the deformities of the jaw were much less marked.

THE INFLUENCE OF ORAL SEPSIS ON DIGESTIVE DISORDERS.

By George M. Niles, M.D.,

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Among the portals of entry for disease, the mouth is naturally the most important. It is the outer vestibule through which the food, drink, and air must pass before beginning their useful functions in the bodily economy; its warmth, moisture, and alkaline reaction offer the necessary conditions for the cultivation of septic products; and there is usually in the mouth plenty of culture material, in the form of food debris, etc., upon which they can grow.

As active etiological factors in digestive disturbances, I do not believe the different manifestations of oral sepsis have received merited attention.

Our enterprising friends, the laryngologists, have studied well the influence of disordered digestive processes upon the throat and postnasal territory, elucidating this part of the subject at length; while the ophthalmologists and aurists have attested their interest by numerous papers. The dentists, like watchmen on the towers, have continually sounded the alarm, and a few adventurous spirits have invaded the ranks of the medical profession, preaching oral prophylaxis from the housetops.

As to any extended or thorough literature covering the title of this paper, I have failed to find it, and the conclusions embodied herein are in a great measure deduced from my own investigations, and supported by fragmentary allusions gleaned here and there.

Before studying the effects, it might be well to enumerate the different organisms, pathogenic and otherwise, which at different times inhabit the mouth: Bacillus buccalis maximus, Bacillus prodigiosus, Bacillus violaceus, Bacterium cerasinum, Bacterium coli commune, Bacterium gingivæ pyogenes, Bacterium termo,

Iodococcus vaginatus, Leptothrix buccalis, Leptothrix innominatus, Micrococcus gingivæ pyogenes, pneumococcus of Friedlander, pseudodiphtheritic bacillus of Roux and Yersin, Proteus vulgaris, Sarcina aurantiaca, Sarcina lutea, Spirillum sputigenum, Spirochæta dentium, Staphylococcus albus, Staphylococcus aureus, Staphylococcus citreus, Streptococcus, Vibrio rugula, and Vignal's bacillus.

As lengthy as is this list, there are many other varieties present not sufficiently studied to classify or name, and, notwithstanding their number, strange to say, this cavity is usually not very septic.

Formerly we were taught that the saliva possessed a bactericidal action, but this has been disproved by Sarinelli, who showed that while saliva was inimical to the Staphylococcus pyogenes aureus, it was so only to a negligible extent.

From experiments performed by Hugenschmidt, in Metchnikoff's laboratory, at the Pasteur Institute, we are led to believe that excessive sepsis is held down by the reciprocal action of the bacteria and their secretions upon each other. Moreover, actual invasion of the buccal cavity is prevented in the normal mouth by the activity of the phagocytes in the mucous membrane, and by the ability of the stratified pavement epithelium to continually shed and renew its superficial layers.

It may be truly said that the mouth is never out of service; but when, instead of being a proper entrance and "testing station" for all systemic and commissary supplies for nutrition and maintenance of heat as they are received into the body, and sent to that distributing centre, the stomach, it also becomes a repository for pus, where hordes of bacteria disport themselves in microscopic glee, proliferating day and night, developing ptomaines and toxins galore, we can easily understand the pathological possibilities of such a focus.

In the limited sense this study purports to cover, septic products in the mouth may set up digestive disturbances by direct absorption from the buccal walls; or, when swallowed, may either act locally upon the gastric mucosa, or may cause fermentation in the stomach or intestines.

The physiological functions of the tonsils are still in doubt, but to some extent they probably act as pharyngeal filters. I have in three instances seen attacks of acute appendicitis follow closely upon the heels of acute tonsillitis, and in each there was also pus around the roots of some of the teeth.

Inquiry among local surgeons failed to elicit any definite data in this respect, but I submit it as worthy of consideration. I might add as a postulate that, if enough nicotine can be absorbed from the buccal cavity alone to produce marked effects, it is entirely reasonable to conclude that pathological bacteria may be also absorbed to an appreciable extent.

Bunge and others have claimed that a not unimportant function of the gastric juice is the sterilization of the stomach. That this can be only partially true is shown by the continued activity of ptyalin before and until the stomach contents become thoroughly acidified. Moreover, according to Lucksdorff, the mouth bacteria constitute at least 3 per cent. of those found in the intestinal contents, where the stomach possesses normal secretory powers. It can be readily seen, therefore, that in achylic stomachs, or those where the hydrochloric acid is markedly deficient, this stream of pus, as it is poured down the esophagus and over the gastric mucosa, may directly kindle an acute gastritis.

This has been demonstrated to my satisfaction by numerous instances, where local gastrites yielded to treatment only after foul mouths had been righted.

Let me quote from Hemmeter: "The direct causes of the rarer idiopathic phlegmonous gastrites are unknown, . . . but, judging from anatomical specimens, are probably bacterial invasions of the submucosa, principally from pyogenic cocci, which find portals of entry through lesions in the superficial epithelium of the stomach, such as occur in most gastric diseases."

Also from Dr. John Fitzgerald: "As regards chronic gastritis, I think that we may take it as proved that it is often caused by swallowed microörganisms and pus. In these cases it is apparently not the microörganisms themselves, but their irritating products which set up gastric inflammation. This is especially true of the yeasts, which give rise to excessively irritating products."

Probably the majority of digestive disturbances arising from oral sepsis are put in motion by fermentations set up in the stomach and intestines. Among the most important are the lactic and butyric acid fermentations, and, as the lactic acid microörganism is invariably found in connection with tartar and pus pockets around the teeth, we see how impossible it is to cure a chronic fermentative gastritis or gastro-enteritis while reënforcements from an unhealthy mouth constantly aggravate the trouble.

With the hydrochloric acid absent or deficient, antiseptic medication amounts to but little, so long as the patient is swallowing countless fresh germs with each meal.

In gastric atony, dilatation, or pyloric obstruction, with delayed evacuation of the stomach contents, oral sepsis produces its maximum evil influence. Especially is this observed in old cases of pyorrhea alveolaris, where the pyogenic organisms, after leaving their "pent-up Utica" in the mouth, find a larger sphere of activity in the stagnant pool always present in the stomach. This fermentation continues with unabated energy in the alkaline and neutral secretions of the intestines, giving rise to flatulence, painful peristalsis, diarrhea, and various other intestinal ills.

Appropriate diet, lavage, and antiseptics can mitigate these

conditions, but no material nor lasting improvement may be expected until the "fountain head" is purified.

Another frequent source of gastric and intestinal disturbance arises from the continual dropping accompanying postnasal catarrh. The influence of this stream of mucus and muco-pus, consciously and unconsciously entering the stomach day and night has been unduly minimized; in fact, a widely known practitioner of this city recently expressed the opinion that the swallowing discharge from such source exerted no injurious effect whatever.

To disprove such a statement, let me ask my readers if they know of any patients with long-standing postnasal catarrh who do not complain of some digestive discomfort; or how many they have observed whose nutrition greatly improved after this constant dropping of mucus was abated.

My case records show many such instances; so many, that I am most careful not to give a too optimistic prognosis in any digestive complaint, coincident with postnasal catarrh, and accompanied by deficient hydrochloric acid secretion, unless intelligent rhinological treatment can also be accorded.

A somewhat extensive experience has convinced me that a large proportion of the indigestion met with among those who throng our clinics arises from postnasal catarrh or pyorrhea alveolaris. From either indifference, ignorance, or poverty these septic oral conditions are neglected, until some of the mouths they bring to us would have made old Augeas think his stables sanitary marvels in comparison.

Less than a month ago there was referred to me a supposed case of pellagra, a man, aged forty years, whose every tooth rested in a seething pool of pus, whose mouth was raw, whose stomach and bowels were upset, whose skin was rough and dry from malnutrition. After this man's mouth was put in decent order, and his alimentary tract permitted to recuperate from the ravages of the purulent host that so long held sway, he was absolutely transformed, leaving the hospital an apparently robust specimen of manhood.

An eminent surgeon told me a short time ago that he never willingly performed any operation on the alimentary canal in the presence of pyorrhea alveolaris. Some unsatisfactory results had taught him this lesson—a lesson being learned by many others.

How many clinics there are where every portion of the human anatomy is carefully investigated excepting the oral cavity. A perfunctory glance at the tongue, and then *away* from the mouth go these diagnostic sleuths, leaving undiscovered in many instances the chief clue to some obscure digestive malady.

In the study and treatment of the manifold diseases of digestion, we are often puzzled at seeming etiological inconsistencies, at therapeutic missiles that fail to reach the spot where we aim.

This brief paper is intended to emphasize the importance clini-

cally of aseptic mouths; to emphasize the malign influence of septic mouths upon the whole alimentary tract; and to suggest that we get in closer touch with our friends and co-workers, the dental surgeons, who can so often furnish us a practical solution of some of our vexed gastro-intestinal problems.

THE PROGNOSTIC VALUE OF THE UROCHROMOGEN AND DIAZO REACTIONS IN PULMONARY TUBERCULOSIS. A PRELIMINARY REPORT.[1]

By Roy C. Heflebower,

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In 1882, Paul Ehrlich[2] first described his diazo reaction, and since that time the literature has abounded in records of the observations of various investigators concerning the test. As this paper deals only with the relation of the reaction to pulmonary tuberculosis, no reference will be made to the occurrence and significance of the test in typhoid fever, measles, scarlet fever, erysipelas, pneumonia, diphtheria, and pyemia.

Ehrlich,[3] himself, considered this reaction to have great prognostic value in pulmonary tuberculosis, and thought that if it were present over a fairly long period of time, it prophesied an early death. However, there seems to be a great difference of opinion in regard to this matter.

Cornet[4] states: "Further investigations of Lovinson, Brecht, Petri, Escherich, Penzoldt, Georgiewsky, Brehmer, Beck, and others, have modified the conclusions of Ehrlich to a certain extent. The reaction is indeed present in a large number of fatal cases of phthisis, especially during a considerable period previous to death. It is not invariably, however, of evil import. It may also be lacking in spite of very severe exacerbations of the disease."

Blad and Videbeck[5] conclude that a pronounced diazo reaction is a sign of an unfavorable prognosis.

Giesler[6] states that it is not found in a majority of cases, even in the third stage, and hence its value in prognosis is limited.

From a study of 663 cases of phthisis, Wood[7] arrives at the conclusion that if the urine shows a continuous well-marked reaction, the prognosis is bad.

[1] Read at the Staff Meeting, U. S. A. General Hospital, Fort Bayard, N. M., October 3, 1911. Published with permission of the Surgeon General, U. S. Army.

[2] Zeit. f. klin. Med., iv, 285. [3] Loc. cit.

[4] Acute General Miliary Tuberculosis, Nothnagel's Encyclopedia of Practical Medicine, p. 409.

[5] Zeit. f. Tuberkulose u. Heilstadte, 1901, p. 412. [6] Ibid., 1902, p. 406.

[7] Medical News, 1903, p. 631.

Lawrason Brown[8] states: "The diazo reaction is recognized to have marked limitations in regard to prognosis. On the whole, however, if the patient has no kidney affection and has taken no salol or other drug which affects it, the constant occurrence of the diazo reaction may be considered as an unfavorable sign. The intensity of the reaction is of considerable import."

Michaelis[9] believes that the presence of the diazo reaction indicates either that the process is extensive or that it will progress very rapidly, and that the prognosis is grave. A cure, he believes, is impossible, and improvement, if any, only temporary. Moreover, he suggests that a fatal result may be expected within six months after the reaction becomes persistently present.

Clemens, Rutimeyer, Frankel, Troje, Gundriss, Cuopf, Goldschmidt, and others have obtained positive results in a large number of fatal cases.[10]

Gwerder[11] discusses the extreme diversity of opinions held by different observers as to the prognostic value of the reaction. He says: "Whereas some consider the positive reaction as an almost certain sign of a bad course of pulmonary tuberculosis, and go so far as to even exclude patients with a positive diazo reaction from the sanatorium, other authors deny any prognostic value in the reaction, pointing out, not entirely without justification, the fact that, on the one hand, cases which pursue a bad course may never show the reaction, or only irregularly; and that, on the other hand, improving patients may have a positive reaction." With reference to these contradictions, he calls attention to the fact that there are some cases in which, as he has shown by his experiments, the Ehrlich body is excreted in the urine, without it being possible to demonstrate this by the usual method. He further states: "It is equally intelligible why one or another case, in spite of a positive test, may improve, if only for a short time, for, in fact, it is only the reaction which lasts a long time which should be considered as of evil omen; while the transitory reaction in any tuberculous patient may occur during the time of an exacerbation, or of a new attack. But such cases are, on the whole, to be regarded only as exceptions."

On the assumption that the content of the urine in Ehrlich's substance is important with reference to the severity of the case, and rises and falls with improvement or deterioration of it, Gwerder endeavored to determine quantitatively the amount of Ehrlich's substance contained in a given urine. He relied upon the fact that the Ehrlich body can be changed by oxidation into a substance which no longer gives a typical reaction, and used a weak solution of potassium hypermanganate (1 to 1000), which he added to the urine drop by drop, until there was no longer a positive diazo reaction. He found that in many cases the amount of potassium

[8] Osler's Modern Medicine, iii, 355.
[9] Deutsch. med. Woch., 1899.
[10] Simon's Clinical Diagnosis, p. 737.
[11] Beitr. zur Klinik der Tuberkulose, xiii, No. 1.

hypermanganate necessary depended upon the severity of the case, and increased with increasing deterioration. Urine treated with a 1 to 1000 solution of hypermanganate of potassium on mixture with the Ehrlich reagent, gave only yellow or brown colors, according to the amount of the potassium hypermanganate. Brown shades, according to authors, are said to have nothing to do with the prognostic significance of the reaction. He, however, thinks that brown discoloration may serve as an indication of the severity of the disease, since we must assume that the brown coloration is caused by bodies which are chemically closely allied with the so-called Ehrlich substance. He states that a close relationship of these bodies with the Ehrlich substance must be assumed, and clinical and similar, although not so bad, prognostic importance must be assigned to them as to the Ehrlich substance. He calls attention to the increased power of reduction which the urines of tuberculous cases often show, and, almost without exception, of urines which give the diazo reaction, although it may occur in those urines in which Ehrlich's body cannot be determined by the usual reagent.

I have spoken at length of Gwerder's use of potassium hypermanganate in his tests, in order that it might not be confused with Weisz's "potassium permanganate" or "urochromogen" test, to be discussed later. Gwerder uses the potassium hypermanganate (K_2MnO_4) in combination with the Ehrlich sulphanilic acid solution; while Weisz uses the potassium permanganate ($KMnO_4$) alone.

Dr. Moriz Weisz[12] assigns as reasons for the contradictory opinions of observers as to the prognostic value of the diazo reaction the facts that the reaction requires a very exact technique; and further, that the sign of a positive reaction, the rose foam, even though the reaction is carefully done, allows for considerable scope of individual judgment, so that it is possible for one observer to call positive a reaction which another would pronounce negative. Then, too, the impossibility of exactly determining the nature of the substance causing the reaction, limits its value, so that one has to rely on empirical opinions.

As a result of six years of experimenting, Weisz concludes that the principal substance causing the diazo reaction is urochromogen. The principal part of the reaction, he states, is due to a low oxidation product of urochrome, the normal yellow pigment of the urine, and this substance he calls urochromogen. He also showed that one of the chief reasons for the uncertainity of the Ehrlich reaction was due to the fact that this principal substance, urochromogen, has an antecedent which does not give the diazo reaction. He found that by adding a solution of potassium permanganate to urines

[12] Münch. med. Woch., June 20, 1911, lviii.

containing urochromogen, the potassium permanganate was reduced, and a yellow color appeared. This test also permitted of the demonstration of the antecedent of urochromogen, the principal substance of the Ehrlich reaction, and was, moreover, far more constant than the diazo reaction. To this reaction he gave the name "urochromogen" or "potassium permanganate" test, and for six years he has used it, instead of the diazo reaction.

He states that urochromogen is found in the urine as a result of defective oxidation, which prevents it from becoming the finished product, urochrome. Such a condition of defective oxidation is present only when the katabolic processes of body metabolism are influenced by some toxin in the circulating blood, that is present in tuberculosis only when the lesion in the lung is sufficiently advanced to either (1) cause a massive invasion of toxin from the Bacillus tuberculosis into the blood stream, or else (2) to cause the organism to submit to an overwhelming power, and to cease its protective function which hitherto had kept the toxins in check.

Regarding the value of his test, Weisz states that it will be readily seen that the excretion of this substance goes hand in hand with an advanced and dangerous lesion, and that generally when it is found, marked physical signs which *per se* would lead to a poor prognosis are present in the lungs. On the other hand, he maintains that cases may be found in which the lesion in the lung is extensive, and which, from physical signs, would lead to a bad prognosis, but in which a negative urochromogen test shows that in spite of a large lesion, the productive power of the organism is ample to prevent the entrance of toxins into the circulation, and thus, that the case is not hopeless for the time being, at least.

He leaves open the question concerning the value of the reaction in regard to the point as to whether an occasional positive test should lead us to give a hopeless prognosis, and also whether we should distinguish between the constant and occasional appearance of urochromogen. His personal views are: (1) Patients who at the beginning of a course of treatment do not show a disappearance of urochromogen from their urine have a hopeless prognosis; (2) the transient appearance of urochromogen can be found in acute exacerbations of the disease, and is to be regarded as a symptom of progression of the tuberculous process; (3) a distinction between continuous and transient, constant, or occasional appearance of urochromogen should be made only as to the prospective duration of the disease; and (4) cases with transient excretion of urochromogen may, if external conditions are favorable, continue to live for several years, while the constant appearance of the reaction, especially when it is plainly becoming more intense, shows a rapid progress of the disease in the lungs and a hopeless prognosis. In brief, he regards as a sign of bad prognosis the appearance of urochromogen in the urine of any case of pulmonary tuberculosis.

He thinks that the further observation of the lives of the greater number of cases, who have shown positive diazo reactions and then apparently improved, would show that in spite of apparent improvement, they sooner or later succumbed to the disease.

At the suggestion of Colonel Bushnell, the Commanding Officer of this hospital, and realizing the truth of the words of Weisz, that "the value of such a reaction, which, so to speak, decides between life and death, cannot be too highly appreciated, as it would also give us a graduated measure for our therapeutic procedures," I undertook a study of the diazo and urochromogen reactions in the urines of patients suffering with pulmonary tuberculosis. I worked with the urines of cases whose physical condition was, with few exceptions, unknown to me, until after I had completed the series of tests. The urines were examined for ten successive days in August, and again in the same way in September. A diazo and a urochromogen reaction was done in each case.

As both Weisz and Gwerder had laid great stress on the question of the use of a proper technique in the diazo reaction, I used the utmost care in this respect. I added to 3 c.c. of filtered urine an equal quantity of a solution containing 50 parts of Solution A to 1 part of Solution B. The formulæ of these solutions are as follows:

Solution A: Sulphanilic acid, 1 part; 5 per cent. solution hydrochloric acid, 500 parts. Solution B: Sodium nitrite, 2.5 parts; distilled water, 500 parts. The mixture was then well shaken and 1.5 c.c. of ammonia added. As recommended by Simon[13] and emphasized by Gwerder,[14] I always studied the color of the ring which formed at the point of contact of the ammonia with the fluid before shaking. In positive cases the intensity of the color of this ring varies from eosin to a deep garnet, and is always more intense than the color of the shaken mixture or the foam.

The technique of the urochromogen reaction consists in adding 3 drops of a 1 to 1000 solution of potassium permanganate to 1 c.c. of urine diluted with 2 c.c. of distilled water. The appearance of a yellow color shows that urochromogen is present. The test is only considered positive when the solution remains clear. In each of the tests for urochromogen, I used a control tube of urine, diluted in the same way, and I would recommend that this procedure be followed in doing the test, as it enables one to distinguish very slight changes in color.

Table I gives the data regarding the cases examined. Table II shows the results of the test in each case. Especial attention is called to Cases 4, 7, 8, and 22, where the positive results seem to have a definite relation with the occurence of hemorrhage, and to Cases 16 and 27, where the excretion of urochromogen seems to be associated with an intense and persistent headache in one

[13] Simon's Clinical Diagnosis, p. 391.

[14] Loc. cit

case, and an attack of acute bronchitis in the other. In these 6 cases the appearance of the urochromogen in the urine seems to have some definite association with the complications mentioned.

TABLE I.—Data regarding cases examined.

Case No.	Duration of disease.	Class.[1]	Involvement.[1]	Maximum temperature.		Weight.		Sputum.	Complications.
				Aug.	Sept.	Aug.	Sept.		
1	10 mos.	I	I	101.0	99.8	203	198	Positive	
2	6 mos.	I	I	100.0	98.4	151	152	Negative	Malaria.
3	8 yrs.	I	I	100.0	100.4	108	108	Positive	
4	1 yr. 2 mos.	I	I	99.4	100.0	176	172	Negative	
5	5 yrs. 5 mos.	II	I	99.2	99.6	169	165	Positive	
6	1 yr.	II	I	98.4	.....	126	...	Positive	
7	2 yrs. 4 mos.	II	I	99.4	100.2	163	165	Positive	
8	1 yr. 2 mos.	II	I	102.6	104.8	138	133	Positive	Syphilis; malaria.
9	6 mos.	II	I	98.4	98.4	129	133	Positive	Chronic bronchitis.
10	1 yr.	II	I	98.4	98.4	146	148	Positive	Syphilis.
11	1 yr. 7 mos.	II	I	98.4	98.4	147	145	Negative	
12	10 mos.	II	I	98.4	98.4	137	...	Negative	
13	1 yr. 1 mo.	II	II	98.4	98.4	117	127	Positive	
14	2 yrs. 3 mos.	II	II	99.4	98.4	139	138	Positive	
15	6 mos.	II	II	101.0	101.6	139	135	Positive	Cervical adenitis.
16	3 yrs. 9 mos.	II	II	100.2	98.4	212	209	Negative	
17	1 yr. 2 mos.	II	II	99.5	98.4	128	126	Positive	
18	7 yrs. 6 mos.	II	II	98.4	98.6	125	127	Negative	
19	1 yr. 3 mos.	II	III	100.2	100.2	137	136	Positive	Chronic pleurisy.
20	7 mos.	II	III	102.0	.....	103	...	Positive	
21	1 yr. 8 mos.	III	II	99.6	99.6	138	136	Positive	
22	7 yrs. 5 mos.	III	II	101.2	99.0	...	110	Positive	Chronic laryngitis.
23	2 yrs. 8 mos.	III	II	101.6	.....	116	...	Negative	Pott's disease.
24	4 yrs. 4 mos.	III	III	101.2	100.0	115	116	Positive	
25	1 yr. 3 mos.	III	III	103.0	103.0	110	109	Positive	
26	1 yr. 11 mos.	III	III	99.0	98.8	100	104	Positive	
27	8 mos.	III	III	100.2	103.2	147	147	Positive	Syphilis; chronic laryngitis.
28	3 yrs. 6 mos.	III	III	99.2	99.0	124	127	Positive	
29	3 yrs. 5 mos.	III	III	98.4	98.4	103	105	Positive	Pott's disease.
30	8 yrs. 6 mos.	III	III	98.4	99.0	117	114	Positive	Chronic laryngitis.
31	7 yrs. 8 mos.	III	III	98.4	99.0	144	151	Negative	Syphilis.
32	9 yrs. 3 mos.	III	III	98.4	98.6	133	133	Positive	Fistula from old empyema.
33	6 yrs.	III	III	99.6	99.2	108	106	Positive	Syphilis.
34	9 mos.	III	III	101.2	102.4	125	122	Positive	
35	1 yr. 7 mos.	III	III	102.0	101.2	104	103	Positive	Chronic laryngitis.
36	1 yr. 2 mos.	III	III	101.0	101.4	102	99	Positive	Chronic laryngitis.
37	3 yrs. 3 mos.	III	III	100.2	101.0	120	116	Positive	
38	3 yrs. 10 mos.	III	III	99.6	99.8	112	...	Positive	Abdominal fistula.
39	6 yrs. 9 mos.	III	III	102.4	.....	105	...	Positive	

A careful study of Tables I and II will show that the cases showing urochromogen more constantly are, for the most part, those cases that are having the greatest temperature elevations and loss of weight. In other words, the cases which are showing the toxic influences of the germs of the disease to a more marked extent are the cases that have a more constant excretion of urochromogen. Case 21 is, according to the physical signs, a very advanced case, yet his temperature is not markedly elevated and urochromogen is absent from his urine. Time only will tell whether the difference between this man and his associates in the same class is that in his case, to use the words of Weisz, "the productive power of the organism is ample to prevent the entrance of toxins into the circulation," and that the giving of a more hopeful prognosis in his case is justified.

[1] Turban's classification.

Table III summarizes the results of the tests. In my series of cases there were positive diazo reactions in 29.1 per cent. of the cases; while 66.6 per cent. gave positive urochromogen tests.

A study of Table II would indicate that there is little or no relation between the extent of the tuberculous involvement and the appearance of the diazo and urochromogen tests in the urine. However, there is a definite relation between the positive findings and the acuity of the process, as is shown by Tables II and IV. The "bed patients" are, of course, the most serious, while the "ambulant" are the least serious cases, the "semi-bed patients" forming an intermediate class. The word "serious" refers to the acuteness and not to the extent of the process. There was a positive diazo reaction in none of the ambulant cases, in 15.7 per cent. of the semi-bed cases and 42.8 per cent. of the bed cases. The urochromogen test was positive in 45.4 per cent. of the ambulant cases, 47.3 per cent. of the semi-bed cases and 80 per cent. of the bed cases.

From the above it will be readily seen that both reactions occur more frequently in the severe cases, and with still greater frequency in the severest cases. The diazo reactions were more intense, and the urochromogen test even more so, in the more severe cases. Not only does the urochromogen reaction occur in a greater number of cases, but it occurs far more constantly than does the diazo reaction.

Weisz states that the excretion of urochromogen may follow the administration of an anesthetic or of tuberculin, but the opportunity to verify these facts has not presented itself.

The observation of these cases has not embraced a sufficiently long period of time to permit the drawing of definite conclusions regarding the probable duration of life after the beginning of the constant appearance of positive reactions. But the results so far seem to warrant the statements:

1. That the frequency and constancy of the appearance of the diazo and urochromogen reactions in the urines of cases of pulmonary tuberculosis is an index to the severity of the condition, a constant negative result pointing to a case that is doing well, while a constant positive result indicates a progressively downward case.

2. That the urochromogen test occurs more frequently, and is more constant than the diazo reaction. It is, therefore, a better index to the condition of the patient than the diazo reaction.

3. That the intensity of both the diazo and urochromogen reactions is of great import as an index to the severity of the condition, especially as a method of determining the difference in prognosis in cases which show the reactions constantly.

I desire to acknowledge my indebtedness to Colonel G. E. Bushnell and First Lieutenant C. E. Holmberg, Medical Corps, for valuable assistance rendered in reviewing the foreign literature.

TABLE II.—Results of tests.

Case No.	Class of patient.	Pulmonary condition.		August.				September.				Remarks.
				Diazo.		Urochromogen.		Diazo.		Urochromogen.		
		Class.	Involvement.	Positive.	Negative.	Positive.	Negative.	Positive.	Negative.	Positive.	Negative.	
1	Bed	I	I	0	10	0	10	0	10	3	7	
2	Bed	I	I	0	10	1	9	0	10	4	6	
3	Bed	I	I	5	5	10	0	6	4	10	0	
4	Bed	I	I	0	10	1	9	0	10	7	3	Positive results in September followed a hemorrhage on September 16.
5	Ambulant	II	I	0	10	0	10	0	10	0	10	
6	Bed	II	I	0	8	2	6	..	..	..	..	Left August 22. "Improved."
7	Ambulant	II	I	0	10	1	9	0	10	3	7	Positive result in August occurred on day of a slight hemorrhage. Bed patient in August. Ambulant in September.
8	Semi-bed	II	I	4	6	6	4	1	9	4	6	Had hemorrhage in August prior to the beginning of the tests. Bed patient in August. Semi-bed in September.
9	Semi-bed	II	I	0	10	1	9	0	10	0	10	
10	Ambulant	II	I	0	10	4	6	0	10	0	10	Has syphilis. Received a dose of salvarsan between conclusion of August and beginning of September tests.
11	Semi-bed	II	I	0	10	0	10	0	10	2	8	
12	Ambulant	II	I	0	10	0	10	0	10	0	10	Sent to duty August 21. "Cured."
13	Semi-bed	II	II	0	10	0	10	0	10	0	10	Bed patient in August. Semi-bed in September.
14	Semi-bed	II	II	0	10	0	10	0	10	0	10	
15	Bed	II	II	3	7	5	5	2	8	5	5	
16	Bed	II	II	0	10	0	10	0	10	2	8	Bed patient in August. Ambulant in September. Bed patient after September 27, on account severe headache. Positive tests on September 26 and 27.
17	Semi-bed	II	II	0	10	1	9	0	10	0	10	
18	Ambulant	II	II	0	10	0	10	..	..	..	..	Left September 13. "Improved."
19	Bed	II	III	0	10	1	9	0	10	5	5	
20	Bed	II	III	1	6	7	0	..	..	..	..	Died August 14, 1911.
21	Bed	III	II	0	10	0	10	0	10	0	10	
22	Bed	III	II	0	10	5	5	0	10	6	4	All positive results since hemorrhage August 21.
23	Bed	III	II	0	7	0	7	..	..	..	..	Left September 1. "Improved."
24	Bed	III	III	1	9	3	7	7	3	10	0	
25	Bed	III	III	5	5	10	0	9	1	10	0	
26	Bed	III	III	0	10	1	9	0	10	0	10	
27	Bed	III	III	0	10	0	10	0	10	6	4	Positive results appeared after ab-

27	Bed	III	III	0	10	0	10	0	10	6	4	Positive results occurred after an attack of acute bronchitis.
28	Ambulant	III	III	0	10	1	9	0	7	3	4	Left September 27. "Improved."
29	Semi-bed	III	III	0	10	5	5	0	8	3	5	Left September 28. "Improved."
30	Semi-bed	III	III	0	10	0	10	0	10	0	10	
31	Semi-bed	III	III	1	9	3	7	0	10	1	9	Bed patient in August. Semi-bed in September.
32	Semi-bed	III	III	..	..	..	..	0	10	0	10	
33	Bed	III	III	9	1	10	0	7	3	10	0	
34	Bed	III	III	5	5	5	5	8	2	10	0	
35	Bed	III	III	0	10	2	8	0	10	6	4	
36	Bed	III	III	10	0	10	0	10	0	10	0	
37	Bed	III	III	3	7	6	4	5	5	9	1	
38	Bed	III	III	0	10	0	10	0	10	6	4	
39	Bed	III	III	3	7	9	1	..	..	..	..	Left August 17. "Unimproved."

TABLE III.

	August.				September.				Summary.			
	Diazo.		Urochromogen.		Diazo.		Urochromogen.		Diazo.		Urochromogen.	
	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.
Cases examined	38	..	38	..	34	..	34	..	72	..	72	
Positive	12	31.5	25	65.5	9	26.4	23	67.6	21	29.1	48	66.6
Negative	26	68.4	13	34.1	25	73.5	11	32.3	51	70.8	24	33.3

TABLE IV.

	August.								September.								Summary.							
	Diazo.				Urochromogen.				Diazo.				Urochromogen.				Diazo.				Urochromogen.			
	Positive.		Negative.		Positive.		Negative.		Positive.		Negative.		Positive.		Negative.		Positive.		Negative.		Positive.		Negative.	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ambulant	0	0.0	6	100.0	3	50.0	3	50.0	0	0.0	5	100.0	2	40.0	3	60.0	0	0.0	11	100.0	5	45.4	6	54.5
Semi-bed	2	22.2	7	77.7	5	55.5	4	44.4	1	10.0	9	90.0	4	40.0	6	60.0	3	15.7	16	84.1	9	47.3	10	53.6
Bed	10	43.4	13	56.5	17	73.9	6	26.0	8	42.1	11	57.8	17	84.2	2	16.7	18	42.8	24	57.0	34	80.0	8	19.0

ON AGAR AS A VEHICLE IN INTESTINAL THERAPEUTICS.

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It is well known that Adolf Schmidt was the first to use agar-agar in order to increase the volume of the feces and thus relieve constipation. Agar itself not proving satisfactory, Schmidt combined it with cascara sagrada under the name of regulin.

Having used agar impregnated with various indicators (tincture of litmus, dimethylamidobenzol, etc.) successfully for chemical reactions in digestive examinations, it appeared to me that its employment could be extended for intestinal therapeutics. Dried agar is eliminated from the digestive tract undigested. While passing the canal it takes up a considerable quantity of fluid, and is then excreted in larger bulk than the original. This quality of agar makes it useful in conditions in which the feces appear in reduced quantity and are too dry.

In intestinal disturbances it is advantageous to apply a remedy that will cover a large area before being absorbed. This can be conveniently accomplished by using agar as a medicinal vehicle. For an agar-containing remedy will first absorb fluid and later liberate the medicinal substance through osmosis. This process takes place slowly, and in this way a large area of the intestines will take up the medicinal agent which has escaped from the agar through osmosis.

Another quality of agar which is advantageous, is its property of retaining fluids and thus increasing the bulk of and also partly softening the feces.

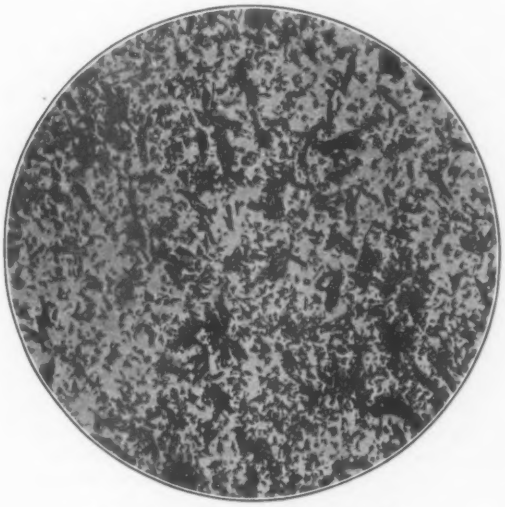
In constipation, therefore, agar as a medicinal vehicle appears at once as a valuable aid. For agar, impregnated with a laxative remedy, will increase the efficiency of the latter by the above-mentioned property of softening the stool.

But in diarrhea agar may also be profitably utilized. In combating diarrheal conditions we must take refuge in astringents, and in severe cases must resort to these in combination with opiates. Such remedies, however, occasionally act too pronouncedly and produce hardened scybala and constipation. In instances in which the mucosa of the bowel is not perfectly intact, but is inflamed or ulcerated, the constipation induced by the remedies given may be more harmful than the primary diarrhea. If, however, the astringent remedy is given in agar as a vehicle, these bad results of hardened feces are obviated. It is, therefore, evident that agar as a vehicle is also useful in diarrheal conditions.

Furthermore, in neurotic disturbances of the intestine agar can

be made to carry a sedative and impart it to a large area of the affected organ.

We can, therefore, make use of medicated agar in the most varied affections of the intestine, for example, in constipation, diarrhea, and enteralgia.



Photograph of rhubarb-agar flakes, natural size.

Preparation of the Agar Remedies. To prepare medicated agar proceed as follows: The medicinal agent is dissolved in a boiling agar water solution, thoroughly mixed, then evaporated to the original dry agar volume. By knowing the quantities taken the medicinal agent can be standardized. The impregnated agar is then ground up into flakes.

I have used the following preparations with advantage:

1. Phenolphthalein-agar. Each level teaspoonful (1 gram) represents 0.03 gram (gr. ½) of phenolphthalein.
2. Rhubarb-agar. Each teaspoonful represents 1 c.c. (♏ 16) fluidextractum rhei (U. S. P.).
3. Calumba-agar. Each teaspoonful represents 2 c.c. (♏ 32) fluidextractum calumbæ (U. S. P.).
4. Gambir-agar. Each teaspoonful represents 2 c.c. (♏ 32) tinctura gambir composita (U. S. P.).
5. Tannin-agar. Each teaspoonful represents 0.03 gram (gr. ½) of tannic acid.
6. Simaruba-agar. Each teaspoonful represents 1 c.c. (♏ 16) tinctura simarubæ (U. S. P.).

7. Myrtill-agar. Each teaspoonful represents 1 c.c. (♏ 16) tinctura myrtill (U. S. P.).

8. Ipecacuanha-agar. Each teaspoonful represents 1 c.c. (♏ 16) tinctura ipecacuanhæ (U. S. P.).

9. Sumbul-agar. Each teaspoonful represents 1 c.c. (♏ 16) fluidextractum sumbul (U. S. P.).

Phenolphthalein and rhubarb-agar (1 and 2) can be conveniently used for the different varieties of constipation. One teaspoonful of either twice daily, after breakfast and supper, in some water, is the average dose. This, of course, may be increased or diminished according to the requirements of the case.

Calumba-agar (3) has proved valuable in cases of colitis (appearance of considerable mucus in the stool) with normal defecation. The average dose is one teaspoonful three times a day after meals, in some water.

Gambir-, tannin-, simaruba-, and myrtill-agar (4, 5, 6, and 7) I have found valuable in diarrheal conditions (acute and principally chronic). The average dose is usually one teaspoonful three times a day, after meals. Myrtill-agar I have also employed in diabetes mellitus, especially if complicated with enteritis.

Ipecacuanha-agar (8) I had prepared with the intention of administering it in amebic dysentery. I have, however, not yet tested it.

Sumbul-agar (9) I have employed in a considerable number of neurotic intestinal disturbances with seemingly good results. The dose was one teaspoonful three times daily after meals, in some water.

As a whole I can recommend the above various agar preparations as valuable remedies in intestinal therapeutics.

REACTIONS INDUCED BY ANTITYPHOID VACCINATION.

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and

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With the object of determining the reactions induced by typhoid bacillus vaccines, we made a series of examinations of ten medical students, who voluntarily received the vaccination during the early part of the past year. We were especially interested in the

change in the number and proportion of leukocytes, but made such other determinations as were necessary to demonstrate that specific antibodies were actually produced. Finding that better results were obtained with a vaccine prepared at the Army Medical School, Washington, D. C., than one which was prepared from our own culture, we used vaccines supplied by Major Russell. This vaccine (No. 44) was prepared by cultivating a non-virulent strain of the typhoid bacillus on slanted agar for eighteen hours, then making a suspension of the growth in sterile salt solution and diluting it so that each cubic centimeter contained 1,000,000,000 bacilli. This was then sterilized at a temperature of 56° C. for one hour and its sterility tested by aërobic and anaërobic cultivation and by animal inoculation. After the addition of tricresol (to make a 0.25 per cent. solution) as a preservative the vaccine was placed in sterile glass ampoules, which were sealed by heat.

Artificial immunization against typhoid fever was first tried on lower animals by means of living cultures of typhoid bacilli. Among the earlier experimenters were Simmons and Fränkel (1886), Beumer, Chantemesse, Widal and Sanarelli.[1] In 1892 Brieger, Kitasato, and Wassermann[2] determined that the use of killed typhoid bacilli was quite as efficient in inducing the production of antibodies as were living bacteria. Pfeiffer's[3] work in 1893 and the following year, in demonstrating the possibility of inducing marked bacteriolysis in the body (Pfeiffer's phenomenon) was a great stimulus to further research, as was also the work on agglutinins by Grubler and Durham in 1896. In 1896 Pfeiffer and Kolle,[4] working together, and A. E. Wright[5] independently, inoculated two men with typhoid vaccines. The laboratory evidence of the production of immunity was sufficiently great to warrant the application of the vaccination on a more extensive basis. In 1897 Wright[6] reported the inoculation of eighteen persons, and the following year introduced antityphoid vaccination on a rather large scale among the English soldiers engaged in the Boer war in southern Africa. Certain unfavorable reports regarding the work in southern Africa caused a partial suspension of the work for a few years. In 1904, on the advice of R. Koch, it was introduced in the German army, and a little later reintroduced among the English soldiers through the efforts of Col. Leishman. In 1908 it was introduced in our own army, the vaccine being prepared under the direction of Major Russel, of the Army Medical School in Washington. The submission of our soldiers to vaccination was at first voluntary but was made compulsory in 1911.

[1] Handbuch der Technik und Methodik der Immunitätsforshung, i, 723.
[2] Zeitschr. f. Hyg., 1892, xii, 137.
[3] Deut. med. Woch., 1896, Nos. 7 and 8.
[4] Deut. med. Woch., 1896, p. 735.
[5] Lancet, September 19, 1896, p. 807.
[6] Brit. Med. Jour., January 30, 1897, p. 16.

Clinical Evidence of Protection. The statistics of Wright[7] on his vaccinations during the Boer war are based on 19,069 soldiers vaccinated as compared with 150,231 not vaccinated. Roughly considered, the vaccination reduced the incidence of the disease about 50 per cent. and the mortality almost 75 per cent. Later, with better technique in the preparation of the vaccine and having the vaccination consist of two or three injections, the results have been still better. According to a recent report of Leishman,[8] based on 5473 persons vaccinated as compared with 6610 not vaccinated, the number of cases of typhoid fever and deaths from that disease was only about one-tenth as high among the former as among the latter. Instances in which protection was definitely proved, although on a smaller scale, are quite numerous.

Our vaccinations consisted of three subcutaneous injections in the arm at intervals of ten days, the first dose consisting of 500,000,000 typhoid bacilli and the other two of 1,000,000,000 each. The reaction may be both local and systemic in character. The local reaction begins usually in from four to five hours after injection and gradually subsides in three to five days. At its height it usually consists of an area of redness about 10 cm. in diameter, which is swollen and tender. Occasionally the axillary lymph nodes are also slightly enlarged and tender. A systemic reaction, consisting of one or more of the following symptoms, pyrexia up to 103° F., headache, malaise, insomnia, nausea, and in rare instances backache, vomiting, chills, herpes labialis, loss of weight, and albuminuria, also sometimes develops. These general symptoms begin usually in five to six hours after injection and disappear before the lapse of forty-eight hours. The reactions following the different injections in the same individual may vary somewhat, but taken on an average they become progressively less (see Table I).

TABLE I.

	Local redness and swelling 8 cm. or more in diameter.	Pain or tenderness in axilla.	No increase of temperature.	Temperature from 98.6 to 100.	Temperature from 100 to 103.	Temperature 103 or above.	Headache	Backache.	Insomnia.	Nausea.	Chills.	Malaise.	"Soreness all over."
First injection . .	10	5	4	6	0	0	2	3	4	2	3	6	1
Second injection . .	10	2	3	7	0	0	1	1	0	0	0	2	3
Third injection (on basis of 9) . . .	9	0	2	7	0	0	0	0	0	0	0	0	0

[7] Quoted by Russell, The Military Surgeon, 1909.
[8] Royal Army Medical Corps, 1909, xii, p. 166.

The frequency with which the signs and symptoms of the reaction developed in the individuals vaccinated, who were male students from twenty-one to thirty years of age, is given in the above table. Ten students received two injections, but only 9 were vaccinated a third time.

The mild character of the reaction is indicated by the fact that of more than 30,000 injections given to the soldiers of the United States Army, there was either no general reaction or only a mild one (temperature elevated but not up to 100° F., or merely headache and malaise) in about 95 per cent., and that in no instance were there any untoward results. In addition to the ten individuals of our series mentioned above, we also obtained a volunteer for vaccination who had had an attack of typhoid fever nine years previously. Following the first injection he had a severe local reaction consisting of swelling and redness of the entire upper arm and extending for two inches below the elbow. This inflamed area, which was very tender, continued for twenty-four hours. After his second injection the above-mentioned symptoms were even more marked and the individual had a temperature of 103.5° and was delirious for ten hours. In consideration of the severity of these reactions it was not thought advisable to give the usual third injection. Russell also reports more severe reactions in those who have previously had typhoid fever.

The reactions upon which the immunity depends or by which it may be measured may be divided into leukocytic, opsonic, phagocytic, agglutinic, and bacteriolytic. That the bacteriolysins are increased can easily be determined by the method of Pfeiffer. The bacteriolytic tests are, however, very unsatisfactory, inasmuch as no method has yet been devised by which the amount of bacteriolysins may be accurately determined. Although some observers[9] have demonstrated that there is a marked increase in the opsonins, determination of the opsonic index is rather unsatisfactory. Somewhat more satisfactory is the estimation of the power of phagocytosis by the dilution method of Neufelt. Using this method, Russell[10] has found that, beginning about the fifth to eighth day after the first injection, there was a rapid rise in the power of phagocytosis, reaching its height in about three weeks, when the phagocytic titer was one to two, occasionally five or six, thousand times as high as that of normal blood, after which it gradually declined until at the end of one year it was again normal. The agglutinins begin to increase at about the same time as the opsonins, as determined by the power of phagocytosis, and rise rapidly until, at the end of three or four weeks, it is possible to get agglutination (Widal reaction) with a dilution of blood serum 500 to 5000 times, or in some cases even 20,000 times. After

[9] Jour. of Med. Research, June, 1910, xxii (New Series, xvii), No. 3, p. 435.
[10] Boston Med. and Surg. Jour., January 5, 1911, clxiv, No. 1, p. 1.

this time it gradually declines, although it may still be possible to secure agglutination with a dilution of 1 to 100 at the end of a year.

Although a number of investigations relative to the degree of immunity as measured by the factors just mentioned have been made, we have found no record of a study of the leukocytic reaction following antityphoid vaccination in the human being. With the object of making such a study, careful leukocyte counts, both total and differential, were made of the ten subjects of our experiment. All of the counts were made at a time to avoid, so far as possible, the influence of digestion. Controls made by injecting as much salt solution and tricresol as is found in one dose of the vaccine did not give any leukocytic reaction.

Table II gives the average leukocyte count (total and differential) of the ten persons as determined before and at different times after the three injections.

TABLE II.

	Total number leukocytes.	Polymorphonuclear neutrophiles.		Small lymphocytes.		Large mononuclears.		Eosinophiles.		Transitionals.	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
FIRST INJECTION.											
Just before	8400	5088	60.7	2544	30.0	424	5.0	137	2.8	132	2.7
One day after	10360	7148	69.3	2020	19.5	736	7.1	176	1.7	124	1.2
Two days after	8680	5900	67.6	1300	15.0	868	10.0	195	2.6	130	1.5
Three days after	8130	4376	61.2	2057	25.3	772	9.5	138	1 7	162	2.0
Four days after	7140	3806	58.3	2070	29.0	685	9.6	164	2.3	57	0.8
Five days after	7111	4338	61.0	1586	22.3	704	9.9	185	2.6	92	1.3
Six days after	7210	4297	59.6	1859	25.8	576	8.0	331	4.6	201	2.8
Seven days after	7960	5150	64.7	1926	24.2	562	7.1	127	1.6	166	2.1
SECOND INJECTION.											
Just before	6510	3647	54.8	2070	31.8	560	8.6	160	2.6	104	1.6
One hour after	7433	4159	57.3	2378	32.0	520	7.0	74	1.0	170	2.3
Six hours after	13540	9522	70.4	2978	22.0	947	7.0	121	0.8	119	0.8
One day after	9280	6958	71.0	1959	21.0	...	....	55	0.6		
Two days after	7911	5505	69.6	1379	17.4	688	8.7	63	0.8	158	2.0
Four days after	7000	4179	59.7	1799	25.7	749	10.7	98	1.4	98	1.4
Seven days after	6311	4077	59.0	2142	31.0	463	7.0	276	0.4	138	2.0
THIRD INJECTION.											
Just before	7742	4830	62.4	1455	18.8	836	10.8	155	2.0	155	2.0
One hour after	9600	6375	66.4	1920	22.4	499	5.2	192	1.2	132	2.0
Two days after	7400	4884	66.0	1659	22.4	444	6.0	59	0.8		
Four days after	6400	3667	57.3	1536	24.0	723	11.2	256	4.0	211	3.3

Total and percentage of various types of leukocytes.

Chart I shows in a graphic way that the increase and decline in the total number of leukocytes occurs relatively about the same time following each injection. The degree of leukocytosis was highest following the first injection, and was successively less for the two subsequent injections. The curve following the second injection is the most representative one, inasmuch as several counts were made at short intervals following this injection. It indicates that the rise in the number of leukocytes in the peripheral blood is rapid and probably at its height in about six hours when the average count was 13,540 as compared with 6510 just before the injection. This corresponds to the time when the subjective symptoms are just beginning. The total count rapidly falls again, to reach the normal level on the second or third day after injection. In one instance the leukocyte count raised from 7200 just before injection to 8600 one hour later and 22,800 six hours after injection.

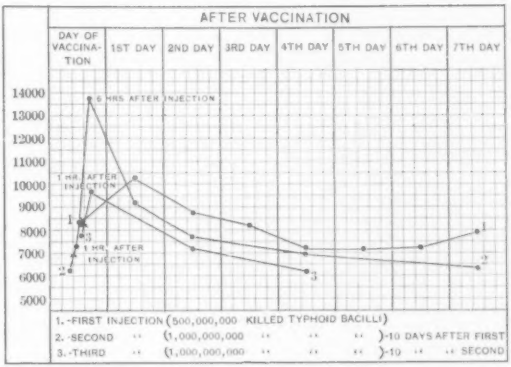

CHART I.—Total leukocyte count following antityphoid vaccination.

Chart II represents in a graphic way the total leukocyte count and the total number of each of the different types of leukocytes following the several injections. It will be noticed that the increase in the total number of leukocytes is due almost entirely to an increase in the number of the polymorphonuclear neutrophile leukocytes and the large mononuclears; the small lymphocytes the transitional cells and eosinophiles remaining about the same. It will also be noticed that the fall in the number of neutrophiles is more rapid than that of the total count, due to the fact that the large mononuclear counts remain rather high for from four to seven days after the injection.

Chart III represents graphically the percentage of the different types of leukocytes following the several injections. Considering

the curves given in Chart II, it is very apparent that the fall in the percentage of small lymphocytes, due to a corresponding increase in the percentage of the neutrophiles during the first six hours after injection, caused a slight decrease in the percentage of the large mononuclear leukocytes. The percentage of the latter rose, however, to above normal, even while the percentage of the neutrophiles was still high. The percentage of the large mononuclears, moreover, continued to remain above the normal even after the total count had become normal.

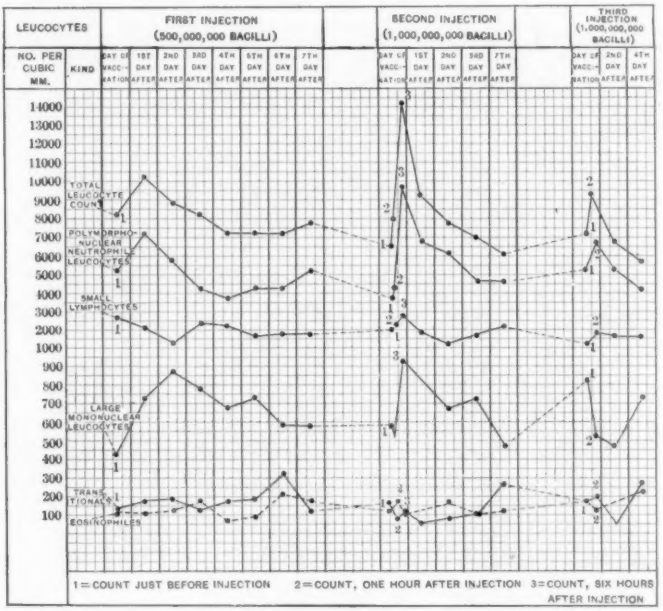

CHART II.—Leukocyte count, total and differential, following antityphoid vaccination.

It will be noted that there are two things about the leukocytic reactions that stand out prominently—(1) the high leukocytosis following injection of the vaccine, and (2) the considerable increase, both relative and absolute, in the number of large mononuclear leukocytes.

The increase in the total leukocyte count is of interest, inasmuch as there is usually no leukocytosis in uncomplicated cases of typhoid fever. It is due principally to an increase in the number of polymorphonuclear leukocytes. Such may readily be explained by the rather marked local reaction induced by the vaccine.

The increase in the number of large mononuclear leukocytes is, however, we believe, of more significance. The large mononuclear cells mentioned all had the same general appearance, but varied in size. A few of them were about the size of the polymorphonuclear leukocyte, but most of them were two to three times as large. The nucleus was usually slightly eccentric, but not peripheral, there being a thin ring of cytoplasm entirely around it. The diameter of the nucleus was usually about one-half the

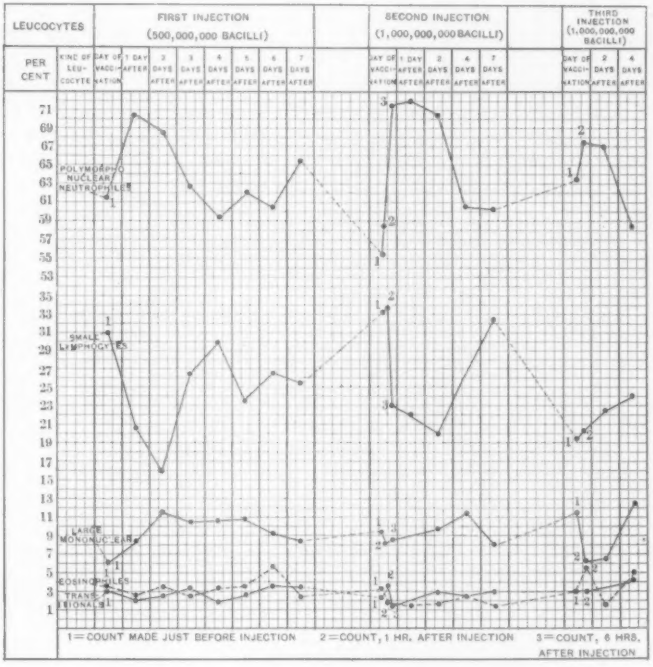

CHART III.—Differential leukocyte count following antityphoid vaccination.

diameter of the whole cell. It was stained deeply blue, being of about the same intensity as the nucleus of the small lymphocytes. The cytoplasm was of a paler blue than the nucleus, but not purplish. There were no definite granules in the cytoplasm, but it was occasionally noted that there seemed to be a very slight fibrillar character to it. At times it was noted that the nucleus was rather indefinite in outline and merged imperceptibly into the surrounding cytoplasm. The stain used was eosinated or erythrosinated methylene blue.

Various observers have noted that there is an increase in the number of the large mononuclear leukocytes in typhoid fever and during convalescence from that disease. Thayer,[11] on analyzing the blood findings of 832 cases of uncomplicated typhoid fever, found that the large mononuclear leukocytes represented on an average 12.4 per cent. of the leukocytes during the first week of the disease, 14.4 per cent. during the fourth week, 16.8 per cent. during the eighth week, at about which percentage it remained until after the fifth week of convalescence.

De Sandro,[12] conducting certain experiments in fatigue with dogs, rabbits, and guinea-pigs, and using "typhoid toxin" as a test of resistance, found that, after injection, there was an initial leukopenia, followed by a leukocytosis, at first of the polymorphonuclear type and later of the mononuclear (especially large) type. Of importance is the observation that in the fatigued animals the initial leukopenia was more marked and prolonged and the subsequent leukocytosis (both polymorphonuclear and mononuclear) was less intense and persistent than in the normal controls. He also found that the influence of fatigue caused the agglutinins to develop less rapidly and to a less extent than under normal conditions.

SUMMARY AND CONCLUSIONS. 1. Statistics based on a large number of cases show conclusively that antityphoid vaccination confers a marked degree of protection against typhoid fever.

2. The injection of typhoid vaccines induces a local reaction in all cases and a general reaction in some cases.

3. A previous attack of typhoid fever apparently causes the reaction to be more severe than is observed in individuals who have not had typhoid fever.

4. Antityphoid vaccination causes a marked increase in the specific agglutinins, opsonins, and bacteriolysins.

5. The injection of typhoid vaccines causes a marked polymorphonuclear neutrophile and large mononuclear leukocytosis.

6. The marked increase (both absolute and relative) of the large mononuclear leukocytes in the peripheral blood is the only leukocytic change which is common to both clinical typhoid fever and antityphoid vaccination.

7. Such occurrences suggests that these leukocytes have something to do with the formation of antibodies concerned with the production of antityphoid immunity.

8. It seems well worth while to attempt experiments on the artificial production of large mononuclear leukocytosis and to see what relation such may have to the production of antibodies in the presence of typhoid infection or antityphoid vaccination.

[11] Johns Hopkins Hosp. Rep., 1900, viii, 487.

[12] Riforma Med., 1910, xxxv, 841 to 871; abstract in Journal of Amer. Med Assoc., September 17, 1910, p. 1064.

A CASE OF BRAIN TUMOR SUCCESSFULLY LOCATED BY MEANS OF THE X-RAYS.

By James Hendrie Lloyd, M.D.,

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AND

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The following case is reported because of the exceptional interest and importance of the *x*-ray picture. The tumor, which had undergone calcareous change, was clearly shown in the skiagram, and was removed. So far as we know, no case of brain tumor, in which the shadow was so clearly shown, has as yet been reported. As is well known, the *x*-rays are usually not of value in localizing these growths. In the present instance success was doubtless due to the fact that the tumor belonged to the class commonly known as psammomata, and was of very unusual size.

J. B., aged seventeen years, male, white. In early life, between the eighth and fifteenth years, the patient had had epileptic attacks, in one of which he fell and struck his right parietal region. This injury was thought to have some relation to his subsequent disorder. Following this fall the left arm and leg were affected with numbness and partial loss of power, which cleared up only after a long period. When aged fourteen years, the boy had a long attack of typhoid fever, after which he had no more epileptic attacks. In 1907 he was bitten by a dog, supposed to be mad, and took the Pasteur treatment.

The first symptoms of organic brain disease began one year before the patient came under our care. He began carrying his head to the right side, and had a sense of stiffness in the neck. Later he began to have an awkward gait, and his vision failed. There seems to have been little if any headache, at least no continuous headache. There had been some vomiting.

On admission to hospital the boy's condition was as follows: His gait was peculiar, the patient having a tendency to go toward the right side, holding his head rotated toward the right. He could walk without assistance across a room, but had difficulty in turning. His vision was evidently defective. There was no true loss of power in either the arms or legs. The knee-jerk was exaggerated on the left side and there was slight ankle clonus on the same side. On the left leg below the knee there was impaired sensation for touch, pain, heat, and cold. Elsewhere sensation was normal. None of the cranial nerves was involved, with the exceptions to be noted. The intelligence was clear, but possibly

a little sluggish. There was no ataxia of the arms, no pain in the extremities. No speech defects.

Dr. Philip H. Moore reported moderate choked disk on both sides, more marked on the left. Media clear. No hemorrhages. Pupils reacted sluggishly to light and accommodation. Right external and superior oblique muscles showed restricted movements.

Dr. Walter Roberts reported no impairment of hearing. The Wassermann test was negative. The patient's general health was good; lungs, heart, and kidneys normal.

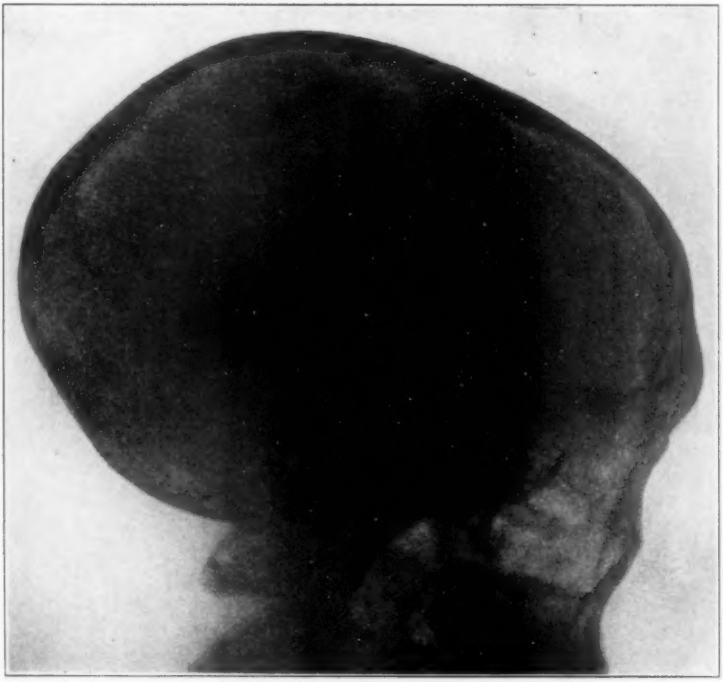

FIG. 1.—*X*-ray picture showing shadow of a brain tumor in the region of the temporal lobe.

The *x*-ray picture, taken by Dr. H. K. Pancoast, showed a very remarkable shadow. It was almost rectangular in shape, about 4 cm. long by not quite 2 cm. wide, and in the region of the temporal lobe (Fig. 1).

The patient was seen later in consultation by Dr. Dercum, at which time we decided on an operation, which was performed by one of us (Dr. Hammond) on June 6, 1911. The opening was made

directly over the spot indicated by the *x*-rays, that is, in the lower part of the right parietal bone, which was found extremely thin. As soon as the opening was made the membranes bulged under great tension. When these were incised a cyst was entered, the fluid escaping in a large quantity and under pressure. Deep within this cyst cavity a hard bony mass was felt; this was also palpated by Dr. Charles H. Frazier, who witnessed the operation. This mass was attached deeply at its posterior part, and was freely movable at its anterior end. On account of its deep attachment it was decided not to attempt to remove the tumor at that time, but to wait and do a second operation, in the hope that, following the line of least resistance, the growth would tend to present at the opening in the skull.

The patient's recovery from the operation was prompt and most satisfactory. In fact, all his symptoms disappeared so completely, that it was difficult to believe, except from the testimony of the *x*-rays and of two highly competent surgeons, that he still carried a hard bony mass, as large as a pullet's egg, in the interior of his brain. His staggering gait was gone, the stiffness of his neck muscles, and consequent rotation of his head, disappeared, and his eyesight became practically normal. Two weeks after operation Dr. Moore found the disks much more clearly outlined, although there was still some haziness about the margin of the left. Pronounced choking had practically disappeared, and the faint outline of the cups was seen. Both nerve heads were pale in color, veins no longer engorged, and arteries normal. The retinæ showed numerous gray opacities, but much less cloudiness and swelling than before the operation. In short, the papillary edema had yielded promptly to decompression.

At this time, however, there was observed some slight astereognosis, such as inability to recognize a key and other objects placed in the left hand; but there was no anesthesia of any kind. The left knee-jerk was still exaggerated, and there was a slight Babinski reflex of the left great toe.

The patient continued in this favorable condition for the six weeks that he remained in the hospital after operation. He seemed so well that he was then allowed to go home in the interior of the State, still under careful supervision and direction. All went well for about another month, when it was observed that he was again losing sight, holding his head awry, and walking to one side. He was accordingly brought back to the hospital. On readmission his condition was very much as when first seen. All his symptoms had returned, and there was nothing to do for the boy but to operate.

At this time Dr. Moore made a very careful study of the visual fields and eyegrounds, and reported as follows: "Pupils large, round, and equal, reacting moderately to light and convergence.

Rotation of globes in all directions normal, with only slight restriction in the extreme temporal movement of the right eye. Media are clear. The right eye has a pale nerve head with distinct margin. The physiological cup is lost. The vessels seem somewhat reduced in size from normal. The retina is slightly cloudy in the lower central area. In the left eye the nerve is less pale than in the right, the nasal margin is hazy, and there is a swelling of possibly one diopter. The vessels present no great departure from normal. The retina is hazy in places, but there are no hemorrhages. The macular region is undisturbed. Vision (without glasses) for the right eye is $\frac{20}{100}$ and for the left eye is $\frac{20}{40}$. With glasses the vision for the right eye is $\frac{20}{50}$ and for the left eye $\frac{20}{30}$. The restriction of the fields of vision is shown by the accompanying charts, and careful plotting of the color fields shows an interlacing suggestive of hysteria."

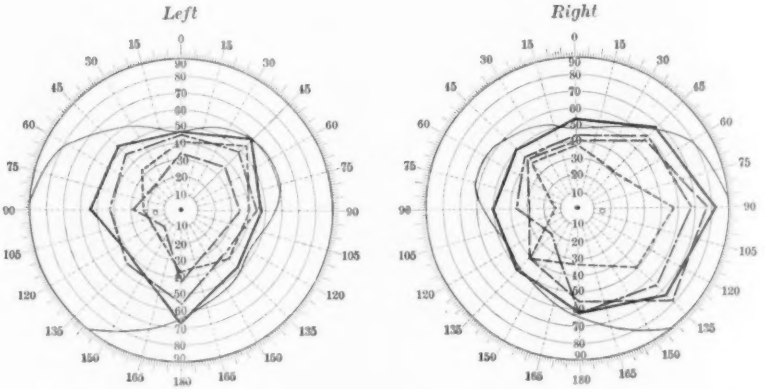

FIG. 2.—Perimeter charts showing restriction of the visual fields and interlacing of the color fields. Solid line = white; — — = red; — · — · — = blue; - - - = green.

One of us (Dr. Hammond) performed the second operation on August 19, more than two months after the first. The tumor was found *in situ*. It had a very peculiar feel to the finger, being like a rather rough stone, deep within the right hemisphere. It was taken out, however, in separate masses, or lobules, which came away without breaking. In other words, it consisted of several large masses and some smaller ones, closely packed together (almost like a nest of gallstones).

Description of Operation. The principles of asepsis were carried out by shaving the head, cleansing, and protecting the cavities accessory to the brain. Under ether anesthesia a free semilunar incision was made through the scalp and pericranium above and

1½ inches posterior to the right auricle, and the flap was reflected forward. A large trephine opening was made through the parietal bone, which was unusually thin; so thin, indeed, that the opening was additionally enlarged by paring off bone with the ordinary sized curved scissors. Immediately on removal of the bony plate internal pressure was so great that a large protrusion filled the opening.

The layer of brain substance beneath the dura was flattened and thinned from the pressure of the fluid in the cyst, which was encapsulated and superficial to the growth. After the rupture of the cyst wall and escape of its fluid contents, the tumor could readily be felt deeply seated above the tentorium and apparently adherent to the falx cerebri in a thin capsule of its own. It was irregular in outline, presenting to the sense of touch at least three distinct nodules. It was not difficult with a pair of long tissue forceps to grasp and remove each of these nodules separately. Hemorrhage, which was not excessive, was controlled by gauze packing. Drainage was inserted, the dura and pericranium carefully approximated over the convolutions, and the scalp sutured. The wound healed by primary union.

The patient stood the operation fairly well, but his condition was never as favorable as after the first operation. He began to fail about the sixth day, developing what was probably a uremic condition, for albumin and casts appeared in his urine, and on the eighth day he had a convulsion. From this he never fully recovered, and died on the same day. An autopsy unfortunately was refused.

It is of interest to note that the patient had been seen and examined by Dr. Charles W. Burr almost one year before he came under the care of one of us (Dr. Lloyd), and that Dr. Burr's notes closely correspond to ours. At that time, however, Dr. W. C. Posey reported a left homonymous hemianopsia, but this was not present at any time when the patient's eyes were examined by Dr. Moore, except that the left half of the right field was somewhat narrowed. In this respect there had evidently been some change in the interval of a year.

The location of the shadow in the *x*-ray photograph indicated a tumor within the posterior part of the right temporal lobe. It was too low to be in the parietal, or parietoöccipital area. This we verified by comparing it carefully with the cast of a brain. This situation may indicate that this tumor, as in the case of most psammomata, sprang from the choroid plexus, and the cyst may even have communicated with the middle horn of the lateral ventricle. If this was so, we succeeded in tapping the ventricle without knowing or intending it. The absence of localizing symptoms is accounted for by the fact that this is a comparatively silent region of the brain. If the growth had been on the left side we should doubtless have had some speech defects. It was too far away to

involve the internal capsule, except a small portion of the sensory paths, as indicated by the anesthesia of the left leg below the knee. The patient's gait was somewhat like that caused by a cerebellar lesion, in the tendency to go to one side, but it was not a true cerebellar ataxia or titubation. We have no satisfactory explanation to offer of the astereognosis of the left hand, unless the tumor, as is often the case with brain tumors, caused more widespread pressure and interference with function than would appear probable from its location.

The microscopic sections were made by Dr. Ellen Corson White, who had some difficulty in decalcifying the material. These sections have been very kindly examined by Professor Allen J. Smith, who gave the following opinion:

"Section of brain tumor submitted by Dr. Lloyd, showed scarcely any matrix, but a great number of concentric psammoma bodies, which were merged in discrete and large fields, as if united after formation into a mass by the deposit of an intervening silicious material of the same character as that in the discrete bodies. In preparing the material for sections, Dr. White had found it impossible to decalcify, which was evidently dependent upon the fact that the concretions were not of plain calcareous nature, but of sand or silicious character. The little stroma recognizable which had refused staining and clear differentiation, probably partly from the action of the decalcifying agents, was evidently of a fibrous nature. From the deep location of the tumor the writer believes the growth probably started from the fibrous tissue of some of the bloodvessels of the cerebral substance."

The opinion of pathologists seems generally to be that these psammomata usually spring from the choroid plexus or pineal gland. Brain sand, as it is generally called, is not infrequently found in this location. The striking characteristic of the present case is the very large size of the psammoma and its great density. Tumors of various tissues, however, such as sarcomata, tuberculomata, fibromata, and lipomata, may undergo some calcareous change, but the change is seldom so complete. Two recent German writers, Zuckermann[1] and Hecht,[2] reporting such calcareous tumors of the brain, suggest that they may be teratoid or of the nature of dermoids, but this suggestion is not original, for dermoid tumors containing bone, teeth, and hair, have been found in the pituitary body and in the lateral ventricles.[3]

The *x*-ray picture in this case is a remarkable one, showing the shadow of the tumor very plainly, also the convolutions both of the cerebrum and of the cerebellum. This clear shadow is, of course, due to the hard bony nature of the tumor. We are not aware that

[1] Virchow's Archiv, 1911, Band cciii, Heft 2, S. 161. [2] Ibid., S. 165.
[3] Beck, Zeitsch. f. Heilkunde, 1884; Gowers, Dis. New Syst., 2d ed., xi, 499, footnote.

any skiagram of a brain tumor has yet been published as remarkable as this one, an opinion expressed also by Dr. Pancoast, who took the picture. In looking at this skiagram we were struck with the clear delineation of the convolutions, and even thought that they showed some degree of flattening or pressure. This suggests a possibility in future cases in which no tumor shadow may be produced. It would, indeed, be interesting and important if we could attain such skill in interpreting skiagrams of the brain as clearly to determine the action of undue pressure beneath the convolutions.

THE RÖNTGEN RAYS IN HYPERTROPHIED PROSTATE: A THERAPEUTIC STUDY.[1]

By James W. Hunter, Jr., M.A., M.D.,
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A casual glance at the enormous literature upon the treatment of hypertrophied prostate would lead one invariably to the conclusion that this is a disease amenable to a great diversity of procedures and consequently likely to give the attending physician but little trouble. Upon further investigation, however, especially when one has had some experience of his own, we must conclude that here, as elsewhere, when a great number of treatments are suggested, few are of value and none specific.

The ideal treatment in cases of hypertrophied prostate is, of course, its radical removal. In the hands of skilful operators the results are excellent. Thus, Judd,[2] reports a mortality of only 29 (from kidney lesions within two months) out of a total of 542 cases operated on by the Mayos. Young's[3] statistics are somewhat better, a mortality of 13 in 400 cases. "During a period of two years and eight months," he writes, "128 consecutive cases were subjected to the operation of conservative perineal prostatectomy without a single fatal result, all of the patients returning to their homes. Forty-three of these cases were over seventy years of age, and 2 were over eighty years of age." Such are the results with selected cases in the hands of our greatest operators. In the ordinary run of cases, however, subjected to the general surgeon, we must expect, as in any other major operation upon elderly people, a high mortality. At least, this is the experience with most of my surgical friends. And what of the inoperable cases? What of those with cardiac, vesical, and renal lesions?

[1] Read at the meeting of the American Röntgen Ray Society, Richmond, Va., September 20, 1911.

[2] Jour. Amer. Med. Assoc., 1911, lviii, 458.

[3] Jour. Amer. Med. Assoc., 1910, liv, 790.

In many cases even when the patient has been subjected to a prostatectomy, nothing has been gained. Thus, to quote Judd:[4] "The functional result, referring to the power to retain the urine after operation, is almost as important as the question of mortality. We rarely see patients with complete incontinence, and consequently obliged to wear a urinal, who can be kept at all comfortable, and many times they are much worse off than they were previous to the operation." And again: "If a catheter be introduced into the bladder and but a slight amount of residual urine is found in a case having marked secondary symptoms without great difficulty in voiding, we may expect little or no benefit from a prostatectomy, no matter how great the tumor's size. . . . We would operate with great risk." This is the testimony of one of our greatest surgeons. If now we add the fact that 34 per cent. of men, aged over sixty years, are affected with genuine hypertrophy of the prostate,[5] and that an exceedingly large number of prostatetics are unfavorable for operation, we must see that in the great majority of cases other means must be tried.

With this in view many of our genito-urinary surgeons have sought means less violent or more or less indirect. Bottini attempted to construct a new canal through the prostate by means of the electric cautery. His operation has, however, been only a partial success. The danger of infection, and the formation of scar tissue, must be reckoned with. Upon the assumption that a double oöphrectomy will cause a diminution in the size of a fibroid uterus, the mutilating operation of castration came into favor. But again success was only partial; likewise, the operation of vasectomy. Nor has medical treatment been of any avail. However valuable as an adjuvant, it cannot remove the cause. In most cases, therefore, prostatic massage through the rectum and the intelligent use of the catheter would seem to be the only remedies.

This same massage is useless if employed upon a sclerosed prostate. At best it can only express the secretion from the gland. The kindly forces of nature may then bring about a reduction in size, but it is more probable that the gland will again expand. What we must seek is a method which will at the same time change the internal structure of the gland. We must limit the growth of the soft prostates; we must soften and reduce the harder ones. Such is the task before us. I know of no agent capable of this save the Röntgen rays, and though they have their limitations, as we shall presently see, it will be my purpose to discuss the possibilities of this new form of treatment.

If we review the histology of the prostate,[6] we find that, unlike most glands, it is surrounded by a capsule made up of non-striated

[4] Loc. cit.

[5] Thompson and Guyon, quoted by Judd.

[6] Böhm, Davidoff, Huber. Text-book of Histology, 1900, pp. 330 to 332.

muscle fibers and yellow elastic fibers. Processes extend inward, thereby breaking up the structure into a number of alveoli. These latter are lined with simple columnar epithelium and contain within the lumen several bodies known as corpora amylacea. When hypertrophy occurs[7] we are dealing essentially with a hyperplasia, chiefly in the epithelial elements, these latter being thrown into folds.[8] In order to accommodate this increase in glandular area, we must also have an increase in the muscle and fibrous tissue. In other words, we are dealing with a condition similar to that found in exophthalamic goitre. And, as the Röntgen rays act mostly upon the epithelium, and especially upon that composing glandular tissue, we may expect a rapid decrease in size. But, on the other hand, if there has been a great increase in the muscle or fibrous tissue, the decrease will be but slight. Hence it is that the first and second degrees of prostatic hypertrophy are most amenable to treatment. If we could only know the microscopic appearance of the gland with which we are dealing, our statistics could, through a careful selection of cases, equal those of any operation.

This line of reasoning has been amply borne out by clinical observation. Thus, Robarts,[9] of St. Louis, reported, in 1902, an improvement in 3 cases of enlarged prostate treated by the Röntgen rays, though he was unable to obtain a radical cure. He came upon this form of treatment by accident and claimed priority. Gautier,[10] during the same year, reported a great relief of the symptoms in these cases, with a diminution of the residual urine. "Decided results," he says, "were obtained in from four to eight sittings." Three years later, in 1905, Carabelli and Luraschi,[11] after waiting a year, reported 2 cases, 1 aged sixty-six years and the other aged sixty-five years, completely cured. In the latter the prostate was greatly enlarged and hard, and the residual urine was reduced from 200 c.c. (f℥vij) to 10 c.c. (f℥iiss). Rollins,[12] of Boston, though reporting no cases, suggested a new technique.

Again, in 1905, Moszkowicz[13] reported 3 cases, aged, respectively, sixty-one, sixty-six, and seventy-seven years, all of whom had to lead a catheter life. On the day following the first sittings the patients could urinate without the use of the catheter; a week later the prostate was softer, and continued to decrease in size. But in the first case, seventeen days after the last irradiation, there was an epididymitis; in the second, fourteen days after, there were symptoms of a hemorrhagic cystitis. Consequently, the third case was treated only once. A little later he, in company with Drag-

[7] Ziegler, Text-book of Special Pathology, American edition, pp. 104, 105. [8] Ibid.
[9] Amer. Jour. Derm. and Genito-urinary Diseases, vol. vi, p. 93.
[10] Giornale di Electriata Medica, 1902, iii, 224, and Brazil Medico, 1902, xvi, 403.
[11] Gazetta degl. Ospedali, abstracted in the Jour. Amer. Med. Assoc., September 2, 1905.
[12] Boston Med. and Surg. Jour., 1905, cliii, 153.
[13] Münch. med. Woch., 1905, liii, 730.

mann,[14] gives his experience with 6 cases, ranging in age from sixty-one to seventy-four years, in which 5 were relieved, and of these, 4 were symptomatically cured.

Tansard and Fleig[15] treated 2 cases. The first was that of a man, aged sixty-three years, who had had two attacks of gonorrhea and one of double orchitis. He was treated nine months and dismissed as cured. The second case, though irradiated only four times, was greatly benefited, though a malignant invasion of the intestinal tract prevented further sittings. Lasseuer,[16] of Lausanne, cites 3 cases, aged sixty-six, sixty-eight, and seventy-two years, who were so greatly benefited that they considered themselves cured, although he had regarded one of them as unfavorable for radiotherapy and advised an operation, which was refused. Tousey,[17] reports that "he has treated several cases, and in some a few *x*-ray treatments have produced a marked reduction in the amount of residual urine and a return of the ability to urinate without a catheter." In a later communication[18] he reports 1 case treated by the Röntgen rays in conjunction with the high frequency electrode as practically cured. To these, Schlagintweit[19] adds that he has irradiated 53 cases, of whom, 30 received more than three sittings. All of these 30, he says, were greatly improved, although in his experience the residual urine did not decrease in proportion to the other improvement.

On the other hand, Bangs[20] doubts the efficiency of the Röntgen-ray treatment as applied to enlarged prostate, and advises the profession to be skeptical of the so-called cures of this condition. He cites a case in which the patient, after treatment with the Röntgen rays, considered himself as cured. But a year later his symptoms recurred, and although he was again treated, he experienced little if any relief. Bangs saw him a little later. The examination at that time, showed an enlarged prostate. Bangs doubts if any real good was accomplished by the Röntgen rays, and thinks that the improvement in the patient was due to the improved hygiene with which he had been surrounded, that is, a Mediterranean voyage, a warmer climate, etc. Consequently, he advises prostatectomy as the only rational method of dealing with these cases.

My own experience has been as follows:

Case I.—Mr. G., a carpenter, aged eighty years, a widower. He suffered with a gastric hyperacidity and chronic cystitis of eight years' duration. The urine showed a large amount of pus,

[14] Münch. med. Woch., vol. ii, p. 1390.

[15] Ann. des Mal. des org. gén.-urin., Paris, 1906, xxiv, 184, and Fleig, Revue Prat. des Mal. des org. gén-urin., 1907–08, lv, 203.

[16] Archives d'Electricité Médicale Experimentale et Clinque, 1907, xv, 371.

[17] Med. Elec. and Röntgen Rays, 1910, p. 999.

[18] Amer. Quart. of Röntgenology, vol. iii, p. 143.

[19] Ztsch. f. Urologie, Band i, Nr. 1, pp. 51 to 33. [20] Med. Rec., 1907, lxxi, 902.

but no involvement of the kidney, though when a young man a calculus had been passed. Other history negative. In December, 1906, he exerted himself too severely while at work, and as a result had a severe orchitis. This yielded to treatment, but on February 2, 1907, there was a beginning of prostatic symptoms, among others a frequency of urination (arising as many as six times a night), with pain and burning about two inches from the end of the penis. In spite of treatment, however, the patient grew gradually worse until April 15, when he was able to void only about one-half an ounce of urine at a time. There was also a marked phosphaturia and about 60 c.c. (f℥ij) of residual urine.

The Röntgen rays were employed as follows: May 2, 1907, first exposure; May 8, second exposure; May 27, third exposure.

Internal medication was then stopped, and the patient enjoyed complete comfort until June 27, when the entire train of symptoms returned in a much aggravated form.

July 6. Fourth exposure. Some relief, but a slight toxemia occurred as a delirium.

July 16. Fifth exposure. Improvement continued, although slight delirium still occurred. Retained urine as long as two hours at a time.

July 22. Sixth exposure. Improvement continued; voided urine with little trouble.

July 31. Seventh exposure. Retained urine as long as normal; only rose once or twice at night. Felt as well as he ever did and passed a large stream.

August 12. Eighth exposure.

August 25. Ninth exposure. Patient was symptomatically well. No untoward symptoms. Rectal examination revealed a prostate only moderately enlarged. The residual urine had been reduced to 15 c.c. (f℥ss).

September 8. Tenth exposure.

October 29. Eleventh exposure. The residual urine had been reduced to 8 c.c. (f℥ij).

No further exposures were given, nor was any further trouble experienced until the middle of June, 1908, when the patient had a severe diarrhea with considerable straining at stool. This frequency of defecation, together with old age and an increasing weakness, caused a return of the prostatic symptoms. He voided every half-hour during the day, arose six to eight times at night, suffered severe pain in bladder and penis, and went to bed.

June 29, 1908. Twelfth exposure.

July 1. Thirteenth exposure.

July 3. Fourteenth exposure. Slight relief.

July 12. Fifteenth exposure. A great improvement. Patient rested better, did not arise more than three times at night and required less anodyne.

July 25. Sixteenth exposure. Save for an extreme weakness and a large amount of urination in the early morning, the patient was symptomatically well.

August 1. Seventeenth exposure.

August 19. Eighteenth exposure. The patient arose only once or twice at night and was gaining in weight.

September 18. Nineteenth exposure. The residual urine varied from 8 c.c. (f℥ij) to 17 c.c. (f℥ss +). Patient remained well.

From this time until his death from cerebral hemorrhage in January, 1909, he remained entirely free from prostatic difficulties. This case, though reported in part on two previous occasions,[21] is of such interest that I have here reported it in full.

CASE II.—Professor A. L. S., French teacher, aged eighty-four years, married, no children. He had suffered with enlarged prostate for many years, had had several acute attacks, and was obliged to use the catheter. His general health, however, was excellent. There were no urinary complications, probably on account of his having taken large amounts of hexamethylenamine. When first seen, on June 16, 1909, there was a very large and very hard prostate with about 32 c.c. (f℥j) of residual urine, also an old intertrigo involving the inner thighs and part of the scrotum.

The first exposure to the Röntgen rays was made on June 16, the second exposure on June 18. Prostate somewhat smaller. Residual urine reduced to 20 c.c. (f℥vss); June 19, third exposure; June 21, fourth exposure; June 24, fifth exposure.

About this time, as there was considerable dermatitis, with an exaggeration of the intertrigo, the patient was advised to wait before further exposures were made. On account of the hot weather, he decided to return in the fall. But this he failed to do, and although I have heard from him occasionally, I think that the permanent benefit was only slight.

CASE III.—Referred by Dr. R. S. Spilman and treated in conjunction with him. Dr. C., physician, aged seventy years, married, two children. Five years ago he consulted a surgeon in Cincinnati and requested a prostatectomy, but on account of his poor condition this had been refused. At that time he was treated by intravesical irrigations of boric acid solution with considerable benefit, but during the last year his condition had rapidly become worse; he had had several chills. When first seen on December 11, 1909, there was continual passage of urine and feces with pain and great tenesmus, a very large and hard prostate, some hemorrhoids, and large, congested testicles. His condition was exceedingly poor. The residual urine equalled about 450 c.c. (f℥xv), and was of a milky color; about one-half was sediment, pure pus. In other words, the patient when seen was moribund.

[21] AMER. JOUR. MED. SCI., January, 1908, and Old Dominion Jour. Med. and Surg., January, 1909.

His treatment was as follows: December 11, 1909, first exposure; December 14, second exposure; December 16, third exposure; December 18, fourth exposure; patient retained urine one hour. December 20, fifth exposure; retained urine one and one-half hours. December 22, sixth exposure; retained urine two hours, and there was less tenesmus. December 24, seventh exposure; condition about the same. Prostate somewhat smaller and harder. December 27, eighth exposure; felt much better, although he retained urine only about one hour. Hemorrhoids much better, testicles normal in size.

From this time until January 27, 1910, no exposures were given, though the bladder was irrigated and hexamethylenamine administered. The residual urine varied from 375 c.c. (f℥xiiss), to 600 c.c. (f℥xx).

On Januray 27 the tenth exposure was given; February 2, eleventh exposure; February 16, twelfth exposure; February 26, thirteenth exposure.

There was little further improvement, though the residual urine was reduced to about 135 c.c. (f℥ivss). His death from pyonephrosis occurred about four weeks later.

Case IV.—Referred by Dr. H. M. Nash. Judge S., lawyer, aged sixty-eight years, married, one child. He had been suffering six months with prostatic symptoms, which had gradually been getting worse. He arose two or three times at night, and has had to use a catheter on several occasions. When first seen, on February 12, 1910, the prostate was moderately enlarged and fairly hard. Urine normal. As the patient requested that no catheter be passed into his bladder, I am unable to give the amount of the residual urine.

The exposures were made as follows: February 12, 1910, first exposure; February 14, second exposure; patient felt better. February 16, third exposure; patient urinated as well as he ever did. February 18, fourth exposure; February 21, fifth exposure; patient felt much better. February 23, sixth exposure; February 25, seventh exposure; February 28, eighth exposure; March 3, ninth exposure. Patient was now able to rest the entire night. Urination normal.

A second series of exposures for prophylaxis were given as follows: April 7, tenth exposure; April 11, eleventh exposure; April 14, twelfth exposure; April 17, thirteenth exposure; April 21, fourteenth exposure; April 25, fifteenth exposure; April 28, sixteenth exposure; May 2, seventeenth exposure; May 5, eighteenth exposure. Prostate reduced in size and soft.

From April 11 to June 10, prostatic massage was also given, with the result that the patient continued to improve, slept the entire night, with no pain upon urination, and there was practically a disappearance of the prostatic enlargement. He complained,

however, of a slight irritation of the deep urethera, which was promptly relieved by the passage of a sound.

From this time until July 1, 1911, he remained free from prostatic symptoms. On that day I was again consulted, and found his prostate somewhat enlarged. It was massaged. This was also done on July 21. Röntgen-ray exposures were given on August 2 and 6. All of the symptoms have disappeared and the patient remains well.

Perhaps in the light of this case we can understand Bangs' somewhat contradictory statements.

Case V.—Mr. A., merchant, aged sixty-eight years, married, three children. He had had prostatic symptoms for about two years. A few months before he had had a severe orchitis, resulting from some heavy lifting. He arose four or five times at night; urinated about every hour and a half during the day; had hemorrhoids and some tenesmus, and his sleep was disturbed. First seen on October 24, 1910, when an examination showed a rather large and moderately hard prostate, with a residual urine of 25 c.c. (f℥vj). The urine was cloudy and contained pus, but no casts. Pulse tension equalled 140 mm. of mercury.

October 24, 1910, first exposure given; October 25, second exposure; October 27, third exposure; October 31, fourth exposure; November 2, fifth exposure. Prostate slightly smaller. Residual urine, 20 c.c. (f℥vss). November 5, sixth exposure; November 8, seventh exposure; November 12, eighth exposure; November 17, ninth exposure. Residual urine still 20 c.c. (f℥vss). November 25, tenth exposure. Sleeps from three to four hours between urinations.

During this series of exposures the bladder was also irrigated and the prostate massaged, while hexamethylenamine and boric acid were internally administered. The residual urine varied from 20 c.c. (f℥vss) to 50 c.c. (f℥iss+). On December 9 the residual urine was 23 c.c. (f℥vj), while he slept the night before as long as four and one-half hours between urinations. On December 24 he arose only twice during the night, while during the day he went as long as four or five hours between urinations.

Röntgen-ray treatments were resumed as follows: December 26, eleventh exposure; residual urine, 14 c.c. (f℥iv). December 27, twelfth exposure; December 31, thirteenth exposure.

The irrigations were continued, and on January 7 the residual urine was 8 c.c. (f℥ij). But from January 13 to February 5 he was confined to bed by a blistered perineum, brought on by his own application of hot compresses in the hopes of easing hemorrhoids. The healing, however, was complete. Irrigation of the bladder and massage of the prostate were again begun, with the use of sounds and some applications of argyrol to the deep urethra. When last seen on April 8, 1911, his urine was still cloudy; he

arose only once, or at most twice, at night, went about four hours between urinations during the day, and slept well. His prostate showed only a very slight enlargement and the testicles were normal in size. In short, save for the cloudy urine, he appeared symptomatically well.

He was, however, not entirely satisfied, and consulted an eminent genito-urinary surgeon in a neighboring city. I have since learned that a papilloma was removed from the bladder and the remaining prostate through a suprapubic opening.

CASE VI.—Dr. E., dentist, aged fifty-eight years, married, three children. He had been complaining for several months of prostatic symptoms gradually becoming worse. Urinated every half-hour, day and night, with great pain and tenesmus; had been treated by a New York electrotherapeutist with a high-frequency rectal electrode without avail. He was rapidly becoming worse. First seen December 6, 1910. At that time I found a large soft prostate and a strictured urethra. The urine was phosphatic and contained pus. Operation was advised for the stricture, but refused.

The following Röntgen-ray treatments were then given: December 6, 1910, first exposure; December 7, second exposure; December 8, third exposure; December 10, fourth exposure; December 14, fifth exposure. No relief. An attempt was made to pass a sound in the office, but it was not successful. An operation was again advised, and this time accepted.

December 23, operation, St. Vincent's Hospital. I did a forceful dilatation of the urethra under anesthesia up to a 29 F. sound. Even then, strange as it may appear, I was unable to catheterize him. That afternoon he emptied his bladder unassisted, the first time in many months. A rectal examination made at the time of the operation showed the prostatic tumor almost gone.

Further Röntgen-ray treatments were given on January 4, 1911, sixth exposure, and on January 26, seventh exposure. Treatment by sounds has been continued. Prostatic symptoms have entirely vanished.

When last seen on May 27, 1911, the patient was advised to continue passing the sounds. His urine, though still very bad, was gradually improving under the use of antiseptics. With the exception of an occasional tenesmus, the old symptoms had entirely vanished.

Of course, in this case it was the dilatation of the urethra that brought about the greatest relief, but to the application of the Röntgen rays must be ascribed the disappearance of the prostatic tumor.

CASE VII.—Judge E., merchant, aged seventy-six years, widower, three children. For three or four years he had been suffering with prostatic symptoms, and arose every two hours during the night.

First seen April 4, 1911. Examination showed a prostate slightly enlarged and soft. Urine normal. Residual urine, 27 c.c. (f℥vij).

April 4, 1911, first exposure made; April 6, second exposure; April 8, third exposure, improvement; April 11, fourth exposure. Arises only twice during the night and considers himself much better.

Further exposures were then discontinued on account of the patient going on a business trip. When seen on May 18, he was advised, on account of the hot weather, to discontinue the treatment until the fall. When seen July 11, he reported a continuous improvement.

The technique in the treatment of hypertrophied prostate is largely one of individual preference. It is a question of position and dosage. Thus, Robarts treated his cases while seated upon a chair, there being a window in the seat exposing the perineum. The tube was placed below. Gautier irradiated both perineum and lower abdomen. Carabelli and Luraschi placed their patients upon an inclined plane. Tansard and Fleig used a specially constructed diaphram. Lasseuer and myself prefer a Sims' position. Lasseuer first irradiates the prostate at right angles to the line of its axis; later, directly upon the perineum. My own cases have been treated in the latter way. Moszkowicz and Schlagintweit employed a rectal speculum, but this feature of their technique has been greatly condemned.

Many of the operators have advised the protection of the testicles by lead foil. They claim that the danger of sterility is thus avoided. In my own series of cases I have found in almost all an abnormal increase in the size of the testicles, most of which, in my opinion, has been due to the congestion resulting from straining. So I have also irradiated the scrotum in all cases save one. I have found great relief and, further, a return to the normal size. As what we wish is a reduction of the prostatic symptoms, and a double castration has often accomplished this end, I am of the opinion that the irradiation of the scrotum is a thing eminently to be desired. Of course, we are now speaking of the prostatic hypertrophy of elderly men. We are not discussing these enlargements in younger subjects due to a gonorrheal infection.

The question of dosage is most important. Many operators have prescribed specific amounts. Thus, Tansard and Fleig prescribed 5 Holznecht units during the first series of irradiations, and another 5 Holznecht during the second. All prefer moderately high and well-seasoned tubes. Tansard and Fleig specify a No. 7 on the Benoist radiochronometer. Schlagintweit, a No. 7 on the Wehnelt scale. Personally, my work has all been done with coils, of which I have had three, one of 12 inch spark length, and two of 18 inches. I have also used both mercury and Wehnelt interrupters. My present technique follows that used in the treat-

ment of skin affections, save that the tube must be hard and well seasoned. I try to place three or four layers of the primary of the coil in series and to use from four to six ampères of current with a Wehnelt interrupter; that is, from one and one-half to two milliampères in the secondary circuit. Exposures of from five to ten minutes are given at frequent intervals and until a moderate dermatitis has resulted. Sometimes I employ the leather filter. There is one thing upon which I do insist. The full physiological dosage must be given. And this varies in different individuals.

Thus we see that the treatment of hypertrophied prostate by the Röntgen rays is closely akin to that used in exopthalmic goitre. It is largely a question of the histological structure of the gland. If the growth is young, and consequently a hyperplasia due to the increase of epithelial and glandular tissue, we may expect brilliant results. On the contrary, if there has been much increase of the muscular or fibrous tissue, it is only by the greater contraction of this tissue that relief can be accomplished. Massage is indicated as an adjuvant in these cases. In the third degree but little benefit may be expected. Aside from the relief of the localized congestion, there will be no improvement in the symptoms. Muscle tissue and old fibrous tissue will not yield to the Röntgen rays.

To conclude: We have in the Röntgen rays a valuable treatment in cases of hypertrophied prostate. As there is no question of mortality, all sufferers may be subjected to its influence. If there is to be an improvement, it will be rapid. If no improvement occurs in a reasonable time, other treatment must be considered.

CANCER OF THE OVARY IN A GIRL, AGED ELEVEN YEARS.

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The occurrence of cancer of the ovary at the age of eleven years, the misleading symptoms, the fact that a complete autopsy was done, and the material worked up thoroughly, makes this, the writers believe, a case well worth reporting.

The history of this patient is as follows: Miss B., aged eleven years, schoolgirl. The family history is unimportant.

Past History. Four months ago she was operated upon in another state for appendicitis. (No pathological report.) The appendix was removed and several small cysts in both ovaries punctured. From this operation the patient made an uneventful recovery, so far as healing of the wound was concerned, but she did not regain her strength. Soon she began to lose weight and ran an irregular temperature. She became pale and pasty in appearance, and spent most of her time in bed, complaining at times of pain in her lower abdomen over both sides.

Present Illness. Six weeks later one of us saw the patient on account of her right knee, which was swollen, somewhat hot, full of fluid, and quite tender—so much so that she could not walk upon it. No other parts being involved, a supporting bandage, ham splint, and rest in bed were advised, and under this treatment her family physician reported that the swelling soon reduced and the pain disappeared.

Six weeks later she was again seen on account of vomiting of several days' duration, increasing emaciation, and general enlargement of the abdomen. She was found much more emaciated, complaining of almost constant epigastric pain, vomiting nearly everything taken, and her abdomen was tensely distended by fluid. On palpation, it was possible to make out a hard irregular tumor in her epigastrium, about the size of a large grape fruit. On vaginal examination little could be gained, as the tense abdominal wall, small vagina and hymen prevented satisfactory palpation. The temperature had been irregularly elevated, but was never over 100.4° in the evening. The leukocytes were 10,800. The urinary findings were negative.

An operation was advised, as it seemed likely that the condition might be tuberculous peritonitis, possibly overlooked at the operation for appendicitis.

Operation. A median incision was made between the umbilicus and pubis, and a large amount of cloudy fluid let out of the abdomen. The hand was then inserted, and everywhere large nodular masses were found.

About the stomach there was a large mass running parallel with the transverse colon. Both ovaries were about equally enlarged, being two or three times their normal size. Their surfaces were symmetrically studded over with nodules, each about the size of a small English walnut. The ovaries themselves were hard, solid, and of abnormal consistency. The pelvis was filled on all sides by a hard nodular growth. Numerous nodules were felt along the root of the mesentery of the small intestine, and everywhere the bowel was bound down by adhesions to these masses. The cecum was examined for the appendiceal stump, but none could be found, as it had been inverted.

After this hasty examination it was at once evident that the

condition was hopeless, and not to be improved by further operation. The right ovary was freed, its vessel ligated, and the organ removed for pathological examination. The abdomen was then hastily sutured, and the patient returned to bed.

Following the operation the abdomen again filled up with fluid, vomiting continued, and the patient gradually failed until the twenty-eighth day, when she died. An autopsy was performed by one of us (Dr. S. R. Haythorn), then of Harvard Medical School Pathological Department, and the report of the presence of an adenocarcinoma and the pathological findings, together with photomicrographs of the tumor, are submitted below.

This case was misleading in that four months before, the abdomen had been opened, its contents explored, and the appendix removed. At that time both ovaries were pulled into the wound to puncture cysts, so that their consistency and size were necessarily noted. The gradual decline, the accumulation of fluid, and the occurrence of an effusion in the knee-joint naturally inclined one toward the diagnosis of tuberculous peritonitis, possibly overlooked during the operation for appendicitis. The rarity of carcinoma at such an age, and the rapid development of all symptoms directly after operation, made the case almost, it seems to the writers, an impossible one to diagnosticate. Had there been less fluid in the abdomen, and had the vagina been larger and without a hymen, evidence might have been obtained from which correct conclusions might have been drawn.

It would seem from the autopsy findings, carcinoma not having been discovered elsewhere than in the ovaries and lymphatics, that there can be only two hypotheses as to its occurrence: (1) A secondary implantation of cells from a carcinomatous appendix directly into the ovaries; and (2) the primary development of carcinoma in the ovary itself, with metastasis into the opposite ovary.

In favor of the first theory is the occurrence of symptoms of appendicitis. Many of the cases of cancer of the appendix have been in young children, and have been operated upon with a diagnosis of appendicitis. One of the writers has observed such a case with typical symptoms of chronic appendicitis. Additional evidence in favor of secondary implantation is the equality in the size of both ovaries and the symmetrical arrangement of nodules in each; the preparation of the ovaries to receive implantations by puncturing of cysts; and the crushing of both tip and base of appendix in its removal, which is known to have been done.

In support of the second theory is the well-known fact that cancer is sometimes primary in the ovary, particularly in young girls, and that it frequently metastasizes into the opposite ovary. Here it must be said that at least some inequality in size between the primary and secondary growth would be expected; although

this is not necessarily true, since elsewhere in the body it has frequently been proved that metastases may outstrip primary growths. The most conclusive evidence in favor of the second explanation is the finding of tumor cells in the ovaries that exactly correspond to the cells found in the metastatic growths. Here we have no supposition, but a fact, and beyond this we can only conjecture.

In going over the literature, it is evident that carcinoma of the ovary in children is very uncommon, but not a rarity. Numerous cases are reported, some of which are carcinomatous degeneration in mixed tumors, others cancerous degeneration of cysts, and others primary carcinoma developing in the ovary itself. Many of the recorded cases are unaccompanied by pathological reports, or at best have only meagre ones, making it almost impossible to group them so that they are of any value. From the writings of others, many points which have been of interest to the writers, may also prove so to others who have not had occasion to go over the literature on this subject.

Many of the cases reported have been operated upon, as was this one, with a diagnosis of tuberculous peritonitis, principally on account of the presence of fluid in the abdomen without anasarca. This has been the most constant sign in the recorded cases, not more than 2 or 3 cases having been reported without it. Other signs which should make one suspicious of malignancy are: Pain, rapid emaciation, cachexia, cessation of menses, and edema of the extremities; particularly bilateral tumors; also hard and knotty ones of rapid growth, and proof of metastasis (Baader[1]). Another condition spoken of by reporters of ovarian tumors in children is the occurrence of early puberty, said sometimes to disappear after the tumor has been removed.

The diagnosis between carcinoma and sarcoma must only rarely be possible. Certain distinguishing signs are pointed out by Berent,[2] however. It is said that sarcoma is almost always primary, and if secondary, is, as a rule, from a uterine tumor, while cancer metastases in the ovaries, even from distant foci, such as stomach and breast, are not at all uncommon. Sarcomas are also said to metastasize and form adhesions later than carcinomas. In regard to size, sarcomas are apt to become much larger than carcinomas. It is also stated that carcinoma in relation to the ovary has a greater preference for young people than sarcoma. This we believe to be doubtful, in view of the number of cases of sarcoma of the ovary reported in young people. Pfannenstiel reports that in a large series the average age for the occurrence of sarcoma of the ovary was thirty-two years, with 40 per cent. in individuals under twenty-five years of age.

[1] Ein Fall von Carcinom des Ovarium im jugendlichen Alter, Tübingen, 1895.
[2] Ueber Maligne Ovarialgeschwülste bei Kindern, Berlin, 1901.

It may, therefore, be concluded, that:

1. The accurate diagnosis of malignant tumors of the ovary in young girls seems rarely possible.

2. Fluid in the abdomen in children without general anasarca, provided adhesive pericarditis and cirrhosis of the liver may be ruled out, should always be investigated by exploratory laparotomy.

3. Ovarian tumors, praticularly in young girls, should be removed with the least possible delay.

4. The occurrence of metastatic nodules in the fossa of Douglas, or in any other location where they may be definitely made out, should be accepted as evidence of extension too great to permit the case to be benefited by operation.

The pathological findings in the ovary that was removed at the operation, as well as a synopsis of the autopsy protocol of this case, are as follows:

SURGICAL SPECIMEN FROM OVARY (Harvard, 1909, No. 766). *Microscopic Description.* The sections were of a rapidly growing medullary tumor, the cells of which varied considerably in size, but were similar in structure. The average cell was twice the diameter of a polynuclear leukocyte. The next most common cell was again as large, and usually possessed from two to four nuclei. A third type of cell was a little larger than a large lymphocyte. The cells were round, oval, indented or elongated, depending upon the compactness of the surrounding growth. There was constantly a wide margin of clear protoplasm about the one or more nuclei, which were globular in outline and slightly vacuolated, giving them a cart-wheel appearance. The nuclei stained deeply and were usually multiple. Occasional monasters and diasters were present. The cells were held in cords or nests by a fine, fibrous reticulum, to which they did not appear to be attached. A general parallel arrangement of these columns of cells was preserved. The connective tissue stroma was gathered together into bands which ran either to a thin capsule or to a central connective mass. The bloodvessels were found only in the connective-tissue strands. Lymph spaces filled with free tumor cells were seen. There was practically no inflammatory reaction present. Diagnosis: Solidly growing carcinoma of ovary.[3]

ANATOMICAL DIAGNOSIS FROM AUTOPSY PROTOCOL. Carcinoma (primary in ovaries). General metastasis of lymphatic distribution occurring in ovaries, uterus, pleura, peritoneum, esophagus, stomach, small intestine, colon, pancreas, gall-bladder, adrenals, urinary bladder, diaphragm, abdominal muscle, skin, mammary glands, and peribronchial, cervical, axillary inguinal, mesenteric, and retroperitoneal lymph nodes.

[3] We wish to express our thanks to Dr. F. B. Mallory and to Dr. Oskar Klotz for their opinions as to the nature of this tumor, and as to its probable primary site.

Other conditions present but not described below were: Atelectasis of lungs, ascites, hydrothorax (double), hydropericardium, edema of the left leg and two healed operation wounds on the abdomen. The absence of secondaries in the organs, namely, heart, lungs, spleen, liver, and kidneys, was striking when compared to the extensive distribution throughout all the lymphoid structures examined.

Synopsis of Autopsy Protocol. The body was greatly emaciated, development slight. Cervical, axillary, and inguinal nodes greatly enlarged, firm, and infiltrated. The left inguinal nodes were enlarged and adherent in a mass over the region of the inguinal ring, causing compression of the femoral vein and edema of the left leg. Nodular extensions upward from this mass infiltrated the whole of the left lower quadrant of the skin and abdomen. Both breasts were enlarged and nodular in contour. The umbilicus protruded slightly. Two healed operation scars were seen on the abdomen—one in the appendix region and the other, 10 cm. long, was 4 cm. to the right of the median line to which it ran parallel.

Pleural cavities: Both pleural cavities contained several hundred cubic centimeters of turbid yellow fluid. On the left there was so great an amount as to completely compress the lung. On the sternum, the upper surface of the diaphragm, and the parietal pleura were numerous spheroidal nodules, white in color and firm in consistency, which extended out into the pleural cavities. The visceral pleuræ were marked by white cord-like lines, having occasional small white bodies situated upon them. These bodies varied in size from small spots to nodules 1.5 cm. in diameter. Two large ones upon the left side were pedunculated.

Left lung: The nodules were most numerous between the lobes. The lung was collapsed, atelectatic, firm in consistency, and dark reddish gray in color.

Right lung: The right lung was larger than the left and was air-containing throughout. The peribronchial lymph nodes were enlarged, several measured 3 cm. in diameter. They were milk white in color, and of moderately firm consistency.

Pericardium and heart showed no tumor.

Peritoneal cavity: A large, white, friable mass, 5 cm. in diameter, lying in the rectus muscle, was bisected by the incision. The breasts contained many similar masses. A large washbowl full of fluid was removed from the abdominal cavity. The parietal peritoneum was studded with innumerable small, white, solid nodules. There was a large chain of closely approximated, encapsulated nodules averaging about 3 cm. in diameter, extending across the omentum between the stomach and the transverse colon. The omentum was free from fat; it contained several small sacs filled with straw-colored fluid. The small intestines were held firmly in place by the mesentery, between the layers of which were great

masses of nodules, many of them 5 and 7 cm. in diameter. The cecum, ascending and descending portions of the colon were densely adherent to the parietal walls. The pelvis was so filled with similar masses that relations could not be made out.

Spleen: The spleen was relatively large. A secondary growth, 2.5 cm. in diameter, was situated in the hilum. The capsule and the splenic pulp were otherwise negative.

Gastro-intestinal tract: The esophagus showed a great number of small nodular secondaries beneath the mucosa. The stomach wall was generally thickened and everywhere studded by small submucous nodular secondaries. The small intestine was firmly fixed throughout its entire length by the large secondaries in the mesentery. Its walls were thickly studded with discrete small spheroidal masses, which lay beneath the mucosa, which were not ulcerated, but produced bulgings in the lumen and beneath the serosa. The cecum was firmly embedded in the pelvic mass. The stump of the appendix could not be found. The condition of the colon resembled that in the small intestine. The rectum was inseparably bound in a mass of new growth in the pelvis.

Liver: The liver was negative and no secondaries were found. There were new growths of a nodular type about the gall-bladder, the bile ducts, and in the gall-bladder wall.

Pancreas: The pancreas was irregularly club-shaped, measuring 14 x 7 x 6 cm. The enlargement was due to new growths involving the lymph nodes about the head of the pancreas, and occurring in smaller masses throughout its length. The new growths were from 3 to 6 cm. in diameter, and were apparently separated from the true pancreatic tissue by a thin fibrous membrane.

Kidneys: The upper pole of the left kidney was embedded in the new growth about the adrenal and separated from it by a fibrous membrane. The growth did not invade either kidney. The ureters and pelves were greatly dilated on account of the pressure of the pelvic tumor constricting the lower ends of the ureters.

Adrenals: About one-half of each adrenal was replaced by a globular new growth. These masses were much softer than those in other parts of the body. The one on the left measured 8 x 5 x 5 cm., and extended downward about the pole of the kidney and rested upon the upper surface of the renal vessels.

Aorta: The aorta was surrounded by masses of lymph nodes containing new growths. The lumen was negative.

Pelvic mass: The pelvis was filled with an adherent, infiltrating, friable tumor mass. A densely adherent, thick-walled cyst was found in the position previously held by the ovary removed at operation. It contained semifluid grayish-red material. The walls measured 2 cm. in thickness, were dark reddish-gray in color, smooth on the inner surface, and friable in consistence. The left ovary was 8 cm. in diameter, firm, hard, and adherent. The

tubes and fundus of the uterus were all bound in an inseparable mass of reddish-gray tumor. This mass was continuous above with the retroperitoneal lymph nodes, and downward with a mass of nodes surrounding the femoral and inguinal rings and vessels.

In taking up the microscopic findings of this case only those points are described which seem to have a more or less direct bearing on the tumor and the distribution of its secondaries. Other conditions which were found are simply mentioned. The microscopic appearances of all the sections which contain new growth are so constant, and so similar to those found in the ovary, removed

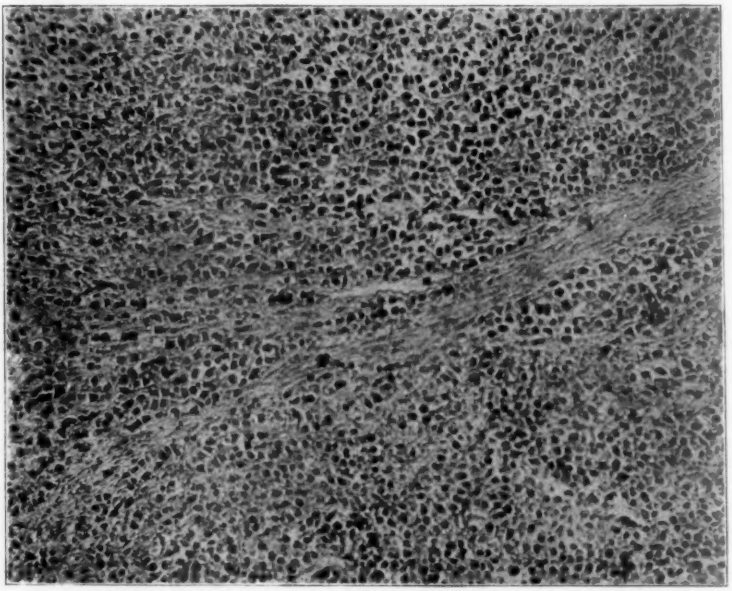

FIG. 1.—Section showing the typical structure of the tumor which was characteristic of the primary and all of the secondary growths. Objective Zeiss AA. Stained with hematoxylin and eosin.

surgically for diagnosis, that further description would cause unnecessary repetition (Fig. 1). The small nodules wherever found look like areas which might have been punched out of the tumor described above. Each one is provided with a very thin fibrous capsule. Hereafter they will be mentioned as secondaries.

Lung: In portions they were completely atelectatic. There was no tumor in the lung proper. Included within some of the lymph spaces of the pleura were typical secondary tumor nodules. In the neighboring lymph spaces and in the lymph spaces of the interlobular septa there were colonies of free tumor cells.

Spleen: The spleen was free from secondaries. The tumor mass at the hilum did not extend through the capsule.

Stomach: Portions of the stomach mucosa were practically normal. These passed gradually into the areas where the crypts had disappeared, and the mucosa had taken on the appearance of the tumor. The surfaces of these areas were necrotic, showed masses of bacteria, and were infiltrated with polymorphonuclear leukocytes. No true ulcers were found. The tumor of the mucosa extended downward to the greatly thickened muscularis mucosa. Numerous secondary tumor nodules were found in the submucosa. The subserous lymph spaces were dilated and filled with free tumor cells. The muscularis showed no secondaries.

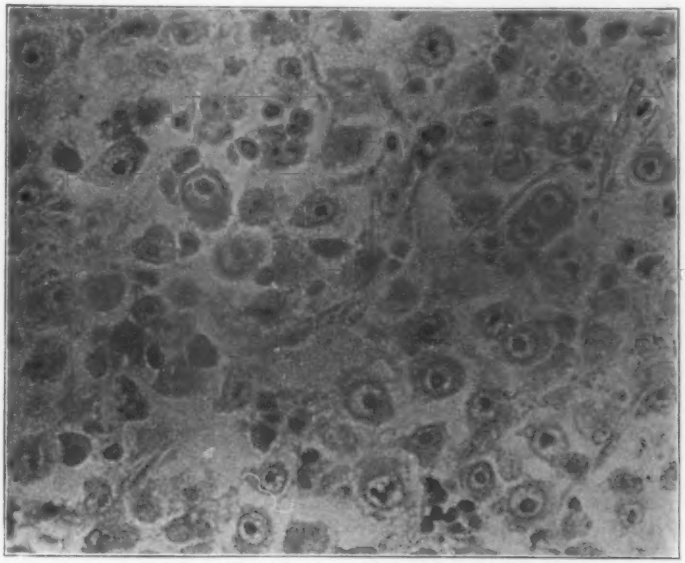

FIG. 2.—A cellular portion of one of the secondaries in the wall of the small intestine. Magnification Zeiss objective DD.

Small intestine: Sections from the upper part of the small intestine showed that the lymphoid tissue had been replaced by tumor tissue, which sometimes appeared as polypoid growths on the sides of the valvulæ coniventes. The connective tissue of the valvulæ was infiltrated with masses of secondaries. The muscular layers were not affected and served to separate the small submucous nodules from the large tumor masses in the mesentery. Sections from the lower part of the small intestine showed the mucosa had been replaced by ordinary granulation tissue (Fig. 2). There

were numerous discrete secondary nodules in the submucosa. The dilated lymph spaces of the mesentery were filled with free tumor cells. Within several veins there were seen, lying free among the red blood corpuscles, cells which to all appearances were tumor cells. These could easily be distinguished from endothelial cells which had been stripped from the vessel walls. Both types of cells were seen in some of the veins.

Pancreas: The pancreatic tissue appeared normal, and was separated from the tumor by fibrous bands. The secondary nodules in the pancreatic lymphatics showed areas of necrosis, in which the parallel arrangement of the stroma was especially well seen. Veins containing tumor cells were seen here in the borders of the secondaries.

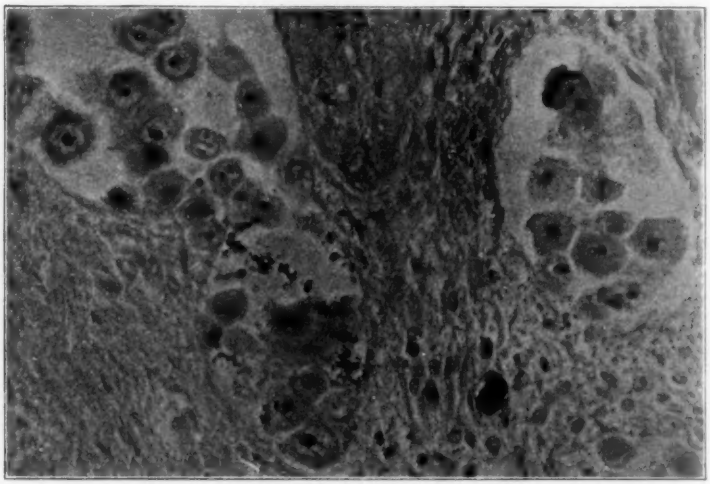

FIG. 3.—Lymph sinuses in the neighborhood of a secondary growth of the mesentery containing free tumor cells. Objective Zeiss DD.

Liver: No secondary growths were found. In the sinusoids and in some of the vessels there were rather numerous large cells. These cells resembled poorly stained tumor cells, were three to five times the diameter of a red corpuscle, had a distinct margin of protoplasm, a poorly stained nucleus, and one or more nucleoli, which were twice the size of the nuclei of the neighboring cells.

Kidneys: There were no secondaries. In some of the veins cells resembling tumor cells were seen. A mass of secondary growth was separated from the kidney by the fibrous capsule.

Adrenals: These showed large nodules of secondary growth.

Pelvic tumor: Sections from the pelvic mass showed the typical

tumor growth. Here the connective tissue reticulum was more pronounced, the multinucleated cells relatively more numerous, and nuclear figures more common.

Summary. To sum up, we have a rapidly growing, malignant tumor, which produced very extensive metastases of lymphatic distribution. The structure was that of an epithelial growth of a round- or oval-celled type, which always reproduced the same picture and never developed cylindrical cells or became scirrhus. These points, added to the fact that the growth was first seen in the ovaries, leads to the supposition that it was primary in one or both of them. Most interesting were the cells in the mesenteric veins and in the

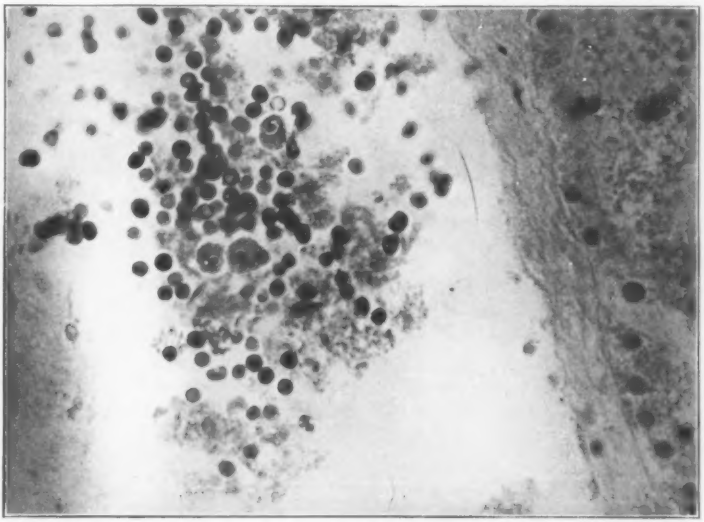

FIG. 4.—Small vein of the mesentery containing free tumor cells. Zeiss objective DD. The background immediately around the free tumor cells was slightly retouched.

liver, which appeared to be free tumor cells (Figs. 3 and 4). In the mesenteric veins there seemed to be little doubt that they were tumor cells, for they exactly resembled those in the lymph spaces, had nucleoli, and were larger than desquamated or wandering endothelial cells. In the liver they were not so well stained, but could be differentiated from displaced liver cells, in that they had larger nuclei, and were free from fat globules and pigment granules, while there was abundant pigment in the neighboring liver cells. Those found in the liver sinusoids were distinguished from wandering endothelial cells with difficulty, their greater size being the only obvious point of difference. None of these cells was found in the lung capillaries. The customary teaching on these tumors which metastasize wholly

by the lymphatics is that the cells do not gain entrance to the blood stream; but granting that the cells observed were tumor cells, another explanation must be sought in this case. Three possibilities have suggested themselves: (1) That the blood had closely associated with it (maybe with the red cells) an immune body which brought about the destruction of the tumor cells, but did not diffuse through to the lymph. (2) That the tumor cells were carried to the liver by the portal circulation and destroyed. (3) The most likely possibility of all is that the question was a quantitative one, the lymphatics in the neighborhood of new growth being filled with great numbers of tumor cells, while some search was required to find those in the veins.

PHYSICAL EXERCISE AND BLOOD PRESSURE.[1]

By Edward O. Otis, M.D.,

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My attention was first called to this subject while making a physical examination of members of a large men's gymnasium. The men were young or middle-aged, with one or two exceptions, and the great majority of them were engaged in indoor sedentary occupations. The exercise was taken as a recreative, hygienic measure, and consisted, for the most part, of the well-known class work, done to music, embracing pulley weights, free hand, dumb-bell, bar-bell, and Indian-club exercises, marching, dancing, deep breathing, and finally, a sharp run; lasting altogether from half to three-quarters of an hour.

It occurred to me that perhaps by means of the systolic blood pressure, taken at three periods, namely, just before, immediately after, and then a little later after a short rest or after the usual bath, I could obtain some definite idea of the effect of the exercise in each individual case, and thus have some practical guide as to the amount and severity of the work best suited to each person. Even the ordinary class work arranged for the average individual might be too severe for some, and, consequently, defeat the purpose for which it was taken as a recreative measure. Of course, I recognized that other elements besides the blood pressure entered into the problem and must be considered, but it seemed to me that the blood pressure might be one test, of a definite character, which would be of practical value in determining the proper kind of

[1] Read before the American Climatological Association at Montreal, June 14, 1911.

exercise and the amount best suited to each person. I accordingly took the maximum blood pressure, at the three periods mentioned, of 59 men, 6 boys, and, through the kind permission of Dr. Sargent, of Cambridge, of 32 young women, pupils in the Sargent Normal School of Physical Education. In addition, I took the blood pressure of the first two periods, just before and immediately after exercise, of 29 men, making, altogether, rather over 350 separate measurements.

I found it no easy matter to make these observations, for my material was not always as tractable as the inert or inarticulate subject of the laboratory. Sometimes after one or two measurements the man would disappear and the observation would be left incomplete. Again, I found more or less difficulty in getting the men before they had taken any exercise; and immediately after exercise a number of men would appear at the same moment for the second measurement, so that the blood pressure of all could not be taken soon enough to make the observation of the most value. I found I could hold the men best by telling them, at the time of the initial measurement, that I could give them no idea as to how their hearts were working until I obtained all three measurements. With the girls it was different, for they were more directly subject to the order of the director of the school, and, in general, they showed rather more intelligent interest.

The measurements were taken with a "Tycos" sphygmomanometer, which I had compared with a mercurial instrument and found to be substantially in agreement with it. I found this instrument exceedingly useful for this work, because the measurements had to be taken rapidly, and this the "Tycos" enabled me to do.

When I began these investigations, I was unaware that so much work had been done upon the effects of muscular effort on blood pressure, both by American and foreign investigators, and I am indebted to my colleague, Prof. Dearborn, for a bibliography upon the subject. Much of the work done by others, however, relates to the effect of severe, extreme exertions upon the blood pressure, while my investigations have to do only with moderate, comparatively mild exercise as illustrated by class work, or with a short, sharp effort, like running up and down stairs, or a few laps on the running track of the gymnasium. In all the investigations, those of my own and others, practically the same results have been obtained as regards the variations of the blood pressure before, during, and after exercise, depending upon the character, length, and intensity of the exercise. In brief, after prolonged and severe exertion there is a diminution of blood pressure from the normal at the conclusion of the effort. Thus, Baldes, Heichelheim, and Metzger[2] examined 12 young men, aged between seventeen and

[2] Münch. med. Woch., September, 1906, No. 38, p. 1865.

twenty-seven years, after a forced march of 100 kilometers, and found in all a diminution of blood pressure. Gordon[3] took the blood pressure of 2 football players in an international Rugby football match, and found a marked fall in both cases. Potter and Harrington[4] found that in 10 Marathon runners, all exhibited a low blood pressure after the race except 1, who was the winner, and who had a pressure of 160 after and 120 before. Three were examined before and after another race, and in the examination after the race all showed a blood pressure below 105, while before it had been 140. Barach[5] found in 55 Marathon race contestants, that the maximum blood pressure before the race was 126.5 (53 cases), and 107.3 (38 cases) after the race. Ten days subsequent to the race the pressure was 124.7 (19 cases). Lowsley,[6] after a twenty-mile race, found the blood pressure below normal, and his conclusions are that "rapid exercises (vigorous, fatiguing, exhaustive) are followed by a fall of pressure below normal which lasts longer than after moderate exercise, even if the former is continued for a very short period and the latter for quite a long period of time; furthermore, the return to the normal pressure after the subnormal phase is slower the more exhaustive the exercise."

On the contrary, after a short period of mild or moderately severe exercise, as in class work, the blood pressure taken immediately at the conclusion of the exercise shows, in the majority of cases, a rise, followed quickly by a fall to or near the normal or to subnormal. as indicated by my results, and those of others. In the exceptional cases when this does not occur, it may indicate that for these cases either the exercise, however mild it may seem, is too severe; or that it was taken in an exhausted condition; or, on the other hand, that those taking it were so well trained that the blood pressure was little if any influenced. Thus Pembery and Todd[7] found that with 2 men running up and down stairs, the one trained and the other untrained, the former showed a smaller rise and a more rapid recovery than in the case of the untrained man. Gordon[8] narrates an interesting incident illustrating the effect of training in the case of the Champion Club Swinger of the World, Tom Burrows by name, aged thirty-eight years, a teacher of club swinging, swinging his clubs, weighing together three pounds, twelve hours continuously for six successive days. Readings of the blood pressure were taken daily before and after the twelve hours' swing, and on every occasion a rise of blood pressure was found at the close of his day's work, in one case the increase being 15 mm. Hg. This was apparently a case of light exercise long continued,

[3] Edinburgh Med. Jour., 1907, xxii, 53.
[4] Jour. Amer. Med. Assoc., 1909, liii, 195
[5] Arch. Int. Med., 1910, p. 382.
[6] Amer Jour. Phys., 1911, xxvii, No. 5, p. 46.
[7] Jour. Phys., 1908, xxxvii, 66.
[8] Loc cit.

by a perfectly trained man, in whom the fatigue point was never reached, a little better than an equilibrium between fatigue and recovery. Cases 71 and 75 in my series, appear also to illustrate this effect of training.

These reasons, however, do not explain all the exceptional cases. Probably the size of the heart and its integrity, the condition of the nervous system, the lasticity of the arteries, the habits and artificial influences like alcohol and tobacco, the age, weight, and perhaps the mental state of the individual, are other reasons. In interpreting the variations of the blood pressure under physical exercise, all the conditions of the individual and his environment must be taken into account. These conditions are so complex and occult that we cannot yet wholly dissociate them or give each its true value.

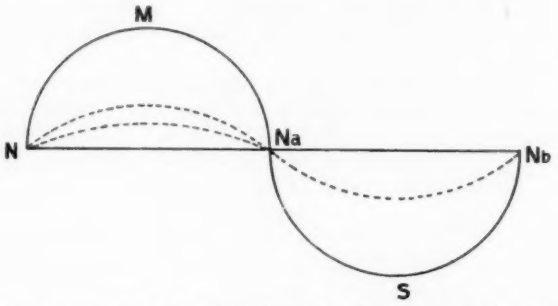
In my 126 cases of moderate general exercise, a mixture of various kinds, as in class work, 97, or 77 per cent. showed a rise of blood pressure immediately after the exercise. In 9, or 8.1 per cent., there was no difference between the first and second measurements; and in 20 cases, or 16 per cent. there was a fall in the second measurement. With the third test, taken from three to twenty minutes after the exercise, in some cases after a simple rest, and in others after the bath, out of 59 men, 45, or 76 per cent., showed either a fall to the initial measurement (supposedly the normal), or to a subnormal pressure, general y the latter. Of course, there is the possibility of error in the two latter measurements, the second and the third, in that the initial blood pressure might have been above the normal from some exercise previously taken, of which I was unaware, for it was difficult to always get the men perfectly fresh from a state of rest.

Reasons for these exceptional cases have already been suggested. To formulate, then, the results I have obtained, as well as those of other investigators, one may say that physical exercise in the majority of cases, of whatever nature it may be, excessive, severe, and long continued, or more gentle and moderate, causes a rise in the systolic blood pressure, the maximum occurring sometimes during the effort. As fatigue sets in and advances, the pressure falls to normal or subnormal. "A maximum systolic pressure," says Lowsley,[9] is reached more rapidly in the case of a fatigued individual, but it is not nearly so extensive." If the exercise ceases at a time when the increased pressure exists, which is indicated by taking it immediately upon stopping exercise, the return toward the normal takes place rapidly, generally within a comparatively few minutes, as was the case with my observations. Or, if it ceases after the fall to subnormal has occurred, as in the case of more extensive fatiguing, and long-continued exertion, then the

[9] Loc. cit.

return *upward* to the normal is slower, depending upon the degree of fatigue and exhaustion. Lowsley considers the subnormal phase following the exercise as an important indication of the effect of the exercise upon the individual. "When," he says, "the subnormal phase returns to normal within sixty minutes, the exercise may be considered as lying well within hygienic limits for that individual; while a return that is delayed beyond 120 minutes may be regarded as exceeding these limits."

We may represent graphically the various phases of the blood pressure during and after physical exercise by a double curve.



Graphic representation of the various phases of the blood pressure during and after physical exercise.

Starting from the normal (*N*) for each individual, and rising until the maximum (*M*) is reached, at a greater or less height; remaining there for a greater or less time, according to the strength of the individual for sustained work, his condition of freshness or fatigue, and his degree of training; then, as fatigue begins and increases, falling and continuing to fall until the normal (*Na*) and subnormal (*S*) point is reached; and finally, after cessation of the exercise and rest, a return more or less rapidly, depending on the degree of fatigue, to normal again (*Nb*).

As will be seen, the majority of my cases, 77, or 76 per cent., represent what might be called the normal, using for the moment the word in another sense, and safe curve of exercise or physical exertion, namely, starting with the normal blood pressure; ending at or near the maximum; and then shortly, in a comparatively few minutes, returning to or near the normal again, it may be a little above or a little below. When this curve is obtained we may say that the exercise or effort is well within the strength of the individual. In certain cases, as I have already indicated, this curve may approximate to a straight line, or only the second curve, the fall from normal to subnormal and the rise to normal again, is found. The blood pressure taken at any period of time during the formation

of this double curve would appear to give some indication of the condition of the individual in relation to the exercise he is taking, and hence serve as a guide to the suitability of the exercise, both as regards severity and duration, or as regards his condition at the time of taking the exercise.

If, for example, immediately after exercise the blood pressure is subnormal and remains so for some time, as in the case of the Marathon runners and football players, or in any case, even if the exercise is moderate and not long continued, such as class work, then for that individual, or for his condition at the time of taking the exercise, we may consider the exertion too strenuous or too prolonged. To illustrate this I will refer to Case 100 of my series. This was a merchant, aged sixty-two years, of delicate build, who, after his day's work, took the class exercise. His initial blood pressure was 138, and immediately after his exercise it was 118, and he looked overworked and tired. It would appear to be a fair assumption that he was in a condition of fatigue at the commencement of his exercise, and hence what he needed was rest and not physical effort. Numbers 34 and 107 seem to be similar cases. In other cases the subnormal second measurement might be explained by the fact that the individual was untrained, and, therefore, more quickly reached the fatigue point. This may have been the case with the three police officers, Nos. 58, 59, and 86, who, after an hour's rather strenuous exercise at handball, showed a subnormal pressure. The case of the two boys, brothers, Nos. 92 and 93, is rather interesting. No. 92, though smaller and younger than 93, has always shown more endurance and vitality than his older brother; and I think the blood pressure measurements would give some indication of this fact, for at the close of the same class work the older showed only 3 mm. Hg rise in pressure, while in the younger it was 10 mm. Hg. Evidently one reached the fatigue point more quickly than the other. Furthermore, the last measurement after a bath showed a lower or at least a more lasting subnormal point in No. 93 than in No. 92.

The case of the 32 young women is interesting and suggestive. In the first place, it will be seen that all, from No. 16 to No. 32 inclusive, 17 cases, who made the short, severe exertion of running up and down stairs, or a rapid run around the track, showed, with one exception, a very much increased blood pressure immediately after their effort, which pressure fell, in from three to eight minutes, to subnormal in 11 cases, and at or a little above normal in the other 6. While, with the other 15 girls who took class work of one kind or another, 9 showed a slight rise of blood pressure immediately after the exercise, 4 a slight fall, and 2 no change. Ten minutes after the exercise, 11 showed a fall to subnormal, 2 were above normal, and 2 normal. It seems to me that a fair interpretation of the comparatively slight variations in the blood pressure of these last 15 girls is that they were well trained, taking

regular, systematic exercise daily, and, further, that they had frequent short rests during the class work. Doubtless other inferences will suggest themselves from this series of observations, but from what has already been shown, it seems to me to be a fair deduction that, taken in connection with other knowledge of the individual, his physical condition, habits, age, training, etc., the blood pressure, taken at the three periods mentioned, may be a valuable guide and aid in apportioning the proper amount of physical exercise to the individual, particularly when it can be so delicately applied as to force, time, and variety as in gymnasium work under skilled supervision. Furthermore, by means of the indications given by the blood pressure, we may be enabled to avoid injury from excess, or from exercise unsuited to the individual.

Anything so sensitive to stimuli and perturbing influences, both within and without, as the blood pressure, must, of course, be subject to wide variations, and, therefore, we cannot expect it to be an accurate guide, but rather an aid of considerable value when taken in connection with other evidene. Panchon,[10] who has published a series of observations upon the maximum and minimum blood pressure taken by an instrument of his own device, which he calls the "oscillometer," declares that the variations of the arterial pressure are valuable criteria in the application of physical exercise, and by them one can make a choice both of the kind and amount of exercise proper for each particular case. "The sphygmomanometric study," he continues, "constitutes a very sensitive criterion of the endurance of the organism during physical work." And with Gallic enthusiasm, he declares that such criteria ought to be applied wherever there is human activity, not only in the case of physical culture, but as well in industrial life, especially where the work should be exactly adapted to the endurance of the individual. Whether or not this French savant had ever heard of the present popular "scientific management" of industries, I do not know, but at any rate, his observations are suggestive in this direction, and it would appear reasonable and be an interesting study to apply his criteria, namely, the blood pressure measurements, to the workingman, if thereby we might more accurately determine his fatigue point, and apportion his work accordingly, and thus both conserve his energy and obtain his maximum efficiency.

I desire to express my obligations to Dr. Sargent, Director of the Sargent Normal School of Physical Education, in Cambridge, to Mr. Hibbard and his assistant, Mr. Browning, of the Young Men's Christian Union Gymnasium, and to Messrs. Roberts and Caswell, of the Young Men's Christian Association Gymnasium, both of Boston, for the very valuable aid they rendered me in making these observations.

[10] Comptes-rendus de la Société de Biologie, May, 1910.

TABLE I.—Blood Pressure and Physical Exercise. Girls of the Sargent Normal School of Physical Education.

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Blood pressure after a rest of from 3 to 20 minutes.	Remarks.
1	E. R.	20	Student	Class work with intervals of rest.	100	115	10 min. after exercise, 95	
2	E. C.	21	Student	Class work with intervals of rest.	114	117	100	The same girl after she had run up and down four flights of stairs had a blood pressure of 114, 140, 120.
3	N. H.	19	Student	Clubs and balls	100	115	100	
4	E. P.	21	Student	Class work	125	136	118	
5	C. P.	22	Student	Class work	120	5 min. after exercise, 117	113	After short, violent exercise the blood pressure was 150.
6	H. B.	23	Student	Class work	125	5 min. after, 115	112	After short, violent exercise, the blood pressure was 150.
7	L. T.	19	Student	Class work	100	115	88	
8	L. G.	22	Student	Class work	90	115	114	
9	H. B.	23	Student	Dancing	114	100	100	The second blood pressure was taken after violent dancing and the third two minutes later.
10	E. G.	27	Student	Dancing	90	100	88	The second blood pressure was taken after violent dancing.
11	D. R.	21	Student	Dancing	115	114	117	
12	I. T.	22	Student	Dancing	94	94	94	
13	L. C.	21	Student	Bounding balls	90	95	85	
14	E. B.	19	Student	Dancing and chest w'ghts.	115	115	90	After violent class dancing the second blood pressure was 150.
15	G. L.	21	Student	Clubs and balls	120	122	115	Another blood pressure was taken after brisk exercise and measured 120
16	M. B.	19	Student	Running up 4 flights of stairs and back	102	130	100	
17	D. Y.	22	Student	Running up 4 flights of stairs and back	115	140	After 5 min. rest, 100	
18	E. A.	27	Student	Running up 4 flights of stairs and back	112	134	115	
19	M. P.	21	Student	Running up 4 flights of stairs and back, twice	90	130	90	
20	F. C.	20	Student	Running 2 laps	114	130	100	
21	K.	21	Student	Running 3 laps	138	158	130	
22	M.	21	Student	Running 4 or 5 laps	120	160	100	
23	C.	21	Student	Running 2 laps	108	122	90	
24	D.	20	Student	Running 2 laps	130	170	130	
25	H.	20	Student	Running 2 laps	118	130	115	
26	W.	20	Student	Running 2 laps	115	118	110	
27	N.	22	Student	Running 3 laps	110	160	115	

TABLE I—(*Continued*).

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Blood pressure after rest from 3 to 20 minutes.	Remarks.
28	C.	20	Student	Running 3 laps	112	152	118	
29	E.	21	Student	Running 4 laps	117	158	112	
30	S.	19	Student	Running 3 laps	115	140	118	
31	F.	20	Student	Running 3 laps	120	152	115	
32	B.	19	Student	Running 3 laps	117	140	116	
	G.	27	Pianist	Played piano for one hour for class	124	120	120	

TABLE II.—Blood Pressure and Physical Exercise. Gymnasium Members. Men.

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Blood pressure after rest of from 3 to 20 minutes.	Remarks.
33	B.	30	Gymnasium instructor	Class work	128	140	135	Taken at another time, it was 120, 120, 135.
34	T.	21	Waiter	Class work	123	120	120	This man works all night and then comes to the gymnasium.
35	R.	31	Dentist	Class work	120	130	116	
36	W.	39	Business	Class work	115	160	117	
37	D.	49	Real estate	Class work	130	140	132	
38	B.	39	Metal polisher	Class work	142	142	115	He had probably been doing some work before the first measurement was taken.
39	McA.	45	Journalist	Class work	139	130	125	He had probably been doing some work before the first measurement was taken. Taken again, the first measurement was 130.
40	J.	37	Baggage master	Class work	115	120	115	
41	P.	53	Shoemaker	Class work	130	160	130	
42	McC.	21	Student	Class work	114	118	110	
43	R.	62	Dentist	Class work and running	140	180	140	
44	W.	28	P. O. clerk	Run a mile	130	185	130	
45	S.	57	Locomotive engineer	Class 15 minutes	140	140	140	Taken another time 145, 145, 120.
46	R.	27	Physical director	Dancing	130	150	120	
47	C.	28	Clerk	Class	140	160	130	Worked all the previous night.
48	F.	22	Waiter	Class	130	150	117	
49	W. A. S.	36	Police inspector	Hand ball	120	130	115	Smokes immoderately.
50	C.	26	Gymnasium instructor	Class and dancing	125	138	118	
51	L.	31	Chauffeur	Class work	138	158	125	
52	S.	19	Stamper	Class work	115	150	112	

TABLE II—(*Continued*).

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Blood pressure after rest of from 3 to 20 minutes.	Remarks.
53	C.	30	P. O. clerk	Class work and a hard ¼ mile run	130	180	114	The third measurement was taken one-quarter of an hour after bath.
54	D.	18	Clerk	Class work	138	180	130	
55	R.	36	Gymnasium instructor	Running 4 laps	120	140	114	
56	V.	19	Gymnasium helper	Running 3 laps	110	154	120	
57	S.	37	Salesman	.....	150	140	138	
58	M.	30	Police officer	Half hour hand ball	115	100	90	
59	G.	33	Police officer	Half hour hand ball	128	120	120	
60	R.	33	Jeweler	.....	100	115	100	
61	R.	26	Salesman	.....	148	168	134	The last measurement seven minutes after exercise.
62	K.	27	Clerk	.....	110	118	116	
63	H.	40	Gymnasium instructor	Dancing and heavy dumb-bells	125	140	120	Taken again, 118, 140, 122.
64	B.	29	Student	Class work	120	132	118	
65	K.	21	At service	Class work	100	115	116	
66	B.	35	Salesman	Class work	117	155	125	
67	C.	41	Masseur	Giving massage briskly	145	170	150	Had been doing some work before first measurement.
68	L.	49	Business	Class work	130	170	120	
69	C.	26	Clerk	Class work	145	140	140	Probably had been doing some work before first measurement.
70	M.	29	Electrical engineer	Class work	100	115	100	
71	E.	30	Lawyer	Class work	130	130	120	Well trained. Exercises three, four or more times a week.
72	S.	33	Stationary engineer	Chest w'ghts. and dumb-bells	120	120	117	Night work.
73	L.	21	Waiter	.....	140	138	138	First measurement after some exercise.
74	B.	20	Attendant	.....	130	115	115	First measurement after some exercise.
75	S.	20	Stenographer	Class work	130	140	130	Takes a good deal of exercise.
76	S.	29	Journalist	Class work	120	134	130	
77	L.	24	Clerk	Was given brisk massage	115	115	117	No exercise, but massage.
78	S.	25	Clerk	Class work	120	140	120	
79	S.	30	Bookkeeper	Class work	130	150	120	
80	M.	25	Electrical engineer	Brisk, severe, short exercise	115	140	117	
81	R.	26	Clerk	Class work	120	150	120	
82	G.	17	Apprentice	Class work	130	130	115	Had taken some exercise before first measurement.
83	L.	25	Draughtsman	Chest w'ghts. and mat work	117	130	115	
84	L.	28	Police officer	Hand ball	115	118	100	
85	McG.	36	Police officer	Hand ball	140	150	125 to 138	Had taken a walk before the first measurement.
86	D.	36	Police officer	Hand ball	135	130	120	Uses alcohol and tobacco to excess.
87	P.	39	Ry. P. O. clerk	Hand ball and dancing	100	115	115	
88	C.	19	Student	.....	115	112	115	
89	C.	40	Lawyer	.....	130	150	132	
90	R.	59	Clerical	Rowing	130	140	125	

TABLE II—(*Continued*). Boys.

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Blood pressure after a rest of from 3 to 20 minutes.	Remarks.
91	D.	15	Apprentice	Class work	100	108	100	
92	E. O.	11	School	Class work	114	124	110	
93	J. O.	13	School	Class work	112	115	95	
94	M.	14	School	Class work	125	118	95	Had been wrestling before the first measurement.
95	H.	11	School	Class work	98	110	98	
96	S.	13	School	Class work	117	110	100	

TABLE III.—Blood Pressure and Physical Exercise. Gymnasium Members. Men.

No.	Name.	Age.	Occupation.	Form of exercise.	Blood pressure before exercise.	Blood pressure immediately after exercise.	Remarks.
97	S.	20	Clerk	Class work	112	126	
98	K.	36	Salesman	Class work	110	118	
99	C.	28	Clerk	Class work	122	150	
100	T.	62	Merchant	Class work	138	118	This man looked overworked and tired out.
101	D.	49	.....	.....	120	140	
102	J.	39	Musician	.....	145	150	
103	S.	19	.....	Class work	100	115	
104	D.	34	Attorney	Class work	120	130	
105	L.	31	Banker	Pull ups and dips	160	180	Exercise had been taken before both of these blood pressures.
106	M.	38	Salesman	Class work	120	128	
107	M.	30	Attorney	Class work	125	115	Says he is overworked in mind and body.
108	P.	37	Weigher	Class work	116	116	Says he took slight exercise before first blood pressure.
109	S.	37	Salesman	Class work	132	140	
110	W.	39	Hotel keeper	.....	115	112	Weight 190. Not used to much exercise.
111	R.	49	Merchant	.....	140	148	
112	S.	46	Physical director	.....	130	142	
113	R.	50	Merchant	.....	130	160	
114	H.	39	Police officer	.....	120	150	
115	S.	43	Merchant	.....	130	160	120.
116	L.	22	.....	Class work	108	140	
117	W.	23	.....	Chest w'ghts.	120	115	
118	B.	20	.....	Class work and running	122	160	
119	B.	18	.....	Class work	138	158	
120	C.	28	.....	Class work, slight	112	120	
121	D.	18	.....	Class work, slight	140	142	Played ball before first blood pressure.
122	M.	24	.....	Class work, slight	150	184	
123	P.	22	.....	Class work	140	170	
124	F.	30	.....	Class work	94	120	
125	A.	19	.....	Class work and running	140	190	
126	H.	61	.....	Running 2 to 3 laps	158	192	

REVIEWS

A Manual of Practical Hygiene for Students, Physicians, and Health Officers. By Charles Harrington, M.D., late Professor of Hygiene in the Medical School of Harvard University. Fourth edition, revised and enlarged by Mark W. Richardson, M.D., Secretary to the State Board of Health of Massachusetts. Pp. 850; 124 illustrations and 12 full-page plates. Philadelphia and New York: Lea & Febiger, 1911.

With the increasing interest in preventive medicine there has been an increasing demand for works on hygiene, which is in reality the science of prevention of disease. Many of these works have been either too elementary and general or too technical and limited in their field of application to be of any great service to the clinician or the general practitioner. The present volume wisely takes a middle course. It deals with the subject of hygiene and its closely related branches in a thoroughly scientific and detailed manner, but yet in terms easily within the grasp of the average clinician and covers the host of subjects in the one volume for which several reference books would usually be necessary.

The advances in the subject have been so rapid and the applications of hygiene to the prevention, etiology, and cure of disease have been so increased and widened in recent years that rather frequent revisions of such worksare necessary. The present work, representing the fourth edition of this book, was begun by Dr. Harrington before his death and completed by Dr. Richardson. The authors have aimed to bring the work thoroughly up to date and to make it as far as possible "an authoritative guide for all classes of readers interested in hygiene and sanitation."

The book may be divided into two parts. The first of 409 pages discusses in its four chapters the fundamental subjects of Foods, Air, Soil, and Water. Each chapter is full of information of a very practical nature, not only for those dealing directly with hygienic problems, but also for the general practitioner who cannot handle and treat diseases intelligently without applying the principles here given. The first chapter on foods contains considerably more than a discussion of their purely hygienic bearing, and gives much information as to the use of food in the preservation of health and in the treatment of disease. In the other three chapters the dis-

cussion covers many of the border line subjects not directly touched on by works on medicine, chemistry, physics, or bacteriology.

The second part of the book, 381 pages, takes up more specifically the application of hygiene in its many various phases. Here are discussed habitations and sanitation, disposal of garbage and sewage, disinfectants and disinfection, military, naval, marine, and tropical hygiene, the relation of insects to human disease, personal and occupational hygiene, vital statistics, immunity, and vaccination, quarantine, and disposal of the dead. In each of these chapters will be found in considerable detail, and yet in a comparatively concise form, the main information usually sought for under the respective headings. In many instances brief *resumes* are given of the laws governing these various hygienic subjects. Concrete examples are quoted from literature to point out the dangers of unhygienic methods or the advantage of proper procedures. The work is unusually complete when the breadth of the subject is considered; it is well written, very readable, and contains few typographical errors. The directions and conclusions are based on sound principles and study, and may be relied upon.

Some of the subjects discussed may, at first glance, seem hardly related to hygiene, and yet the author in every case makes clear the definite bearing of these subjects to the cure or prevention of disease.

The book has well fulfilled its mission and should prove interesting and helpful to any one interested in the subject of hygiene or the still broader one of medicine. F. H. K.

DIET IN HEALTH AND DISEASE. By JULIUS FRIEDENWALD, M.D., and JOHN RUHRÄH, M.D. Third edition; pp. 765. Philadelphia and London: W. B. Saunders Company, 1909.

THROUGH some complication the review of this admirable book is late in appearing. This edition, the third, is entered abreast of the times and differs from its predecessor in as much as the articles on milk and on alcohol have been rewritten and additions to the articles on tuberculosis, salt-free diet, rectal feeding, and caloric needs of infants have been made. Many other important tables have been inserted, for instance, that showing the coloric value of foods and that of Winton on the composition of diabetic foods. One criticism might be made of these tables, and that is, that calories are reckoned on the "fuel value per pound" method, instead of the far easier, far preferable, and more widely used method of fuel value per gram.

This edition maintains the same high standard of the first and second editions, and its features are terseness and cleanness of description with a wealth of detailed diets. The authors have succeeded in offering a work invaluable to the practising physician to whom it is heartily recommended. E. H. G.

SURGICAL AFTER-TREATMENT. A MANUAL OF THE CONDUCT OF SURGICAL CONVALESCENCE. By L. R. G. CRANDALL, A.M., M.D., Assistant in Surgery at Harvard Medical School. Pp. 803; 265 illustrations. Philadelphia: W. B. Saunders Company, 1911.

THIS excellent work admirably serves the purpose for which it was written—to place in the hands of house surgeons in hospitals and of general practitioners in communities which are not surgical centres, a series of suggestions, based on experience and on common sense, as to the after-care of surgical patients. This is, however, the author's too modest estimate of his own achievement. It might well be added that there are few operating or consulting surgeons who would not be benefited by occasional reference to this book.

It is certainly true that as years and experience increase, the busy surgical practitioner tends—like every worker in any department of human endeavor—to become more rigid and less flexible, to be guided more and more by habit and routine, and finally, as self-confidence justifiably develops, to become unwittingly more or less impervious to new ideas. He may, and usually must, be familiar with the latest improvements or the differing methods in operative and aseptic technique, but he is too apt to lose sight of the details—often all-important—of the patient during the after-period, when the prompt recognition and skilful treatment of conditions easily manageable in their incipiency prevent them from becoming threatening or fatal.

Perfunctory advice to the general practitioner, the interne, or the nurse who has the continuous charge of the case, is worse than none, as in the absence of individual experience they often follow blindly, with a sort of military discipline, directions that have become inapplicable or even harmful. Reference to such a book as this, on the part of all concerned, would in many cases avoid these dangers, would give the relatively inexperienced a safe guide in many critical conditions, and would often suggest to the operator or consultant alternatives that might otherwise be forgotten or might be outside his own personal experience.

The scope of the book is catholic and the subjects dealt with

vary from thirst, pain, sleep, hiccough, diet, bedsores, rectal feeding, bandaging, massage, and such obvious generalities, to specific operations on all the important organs and regions of the body.

The first part contains, in addition to the above articles, chapters on various relatively recent surgical methods, such as the Bier hyperemic treatment, saline fomentations, *x*-ray and radium therapy, etc.

The second part is equally up to date and shows on every page familiarity with the practice and the records of the most recent operative procedures. Throughout the book there is an absence of dogmatism, an effort to deal judicially with opposing views, and a display of common sense in the advice offered that is noteworthy and is much to be commended.

The hackneyed remark that "no surgeon's library should be without this book" might well be expanded to include the libraries of all who have anything to do with the after-treatment of surgical cases. J. W. W.

A Text-book of Meat Hygiene. With Special Consideration of Antemortem and Postmortem Inspection of Food-producing Animals. By Richard Edelmann, Ph.D., Medical Counsellor; Royal State Veterinarian of Saxony; Professor at the Royal Veterinary High School in Dresden. Authorized translation, revised for America, by John R. Mohler, A.M., V.M.D., Chief Pathological Division, U. S. Bureau of Animal Industry, and Adolph Eichhorn, D.V.S., Senior Bacteriologist, Pathological Division, U. S. Bureau of Animal Industry. Pp. 392; 152 illustrations and 5 colored plates. Philadelphia and New York: Lea & Febiger, 1911.

That a second edition of Mohler and Eichhorn's translation of Edelmann's Meat Hygiene has been called for is very encouraging, since it may be regarded not only as an evidence of approval of the work, but also as an indication that this division of public hygiene is receiving at least a portion of the attention it deserves.

The general arrangement of the material is the same as in the first edition, but a few parts which have become obsolete have been omitted, while new facts, established since the earlier publication, have been added. Portions of the book have been rewritten, and where this has been done there has been a gain in clearness and conciseness, although the first edition was by no means deficient in this respect.

Involving as it does certain facts connected with the physiology of the meat-producing animals and the parasitology, bacteriology, and pathology of the diseases affecting them, the decomposition

processes to which meat and meat products are liable and the methods of preservation, together with the sanitation of abattoirs, etc., the subject of meat hygiene is not one that lends itself readily to discussion in a single volume, but in this book all of the principles underlying the rational practice of meat hygiene are presented concisely, and yet comprehensively, in less than 400 pages, adapting it for use as a work of reference as well as a text-book. These basic principles are, of course, as applicable in the United States as in Germany, but the text of the original German work has been supplemented by such additions as are necessary because of the differences in the practice in this country and in Germany.

The regulations governing the meat-inspection service of the United States Department of Agriculture and a chapter on the organization and the methods of procedure of the Federal inspectors have also been inserted. This material, together with the chapters on the origin and source of meat food, the production, preparation, and conservation of meat, and the construction of abattoirs and stockyards, should be of especial interest to health officers or others in charge of the enforcement of local meat-inspection laws, and also to those who may contemplate the organization of local inspection systems; while practising physicians will find information of value in the chapters on the postmortem changes of meat and on meat poisonings. The other portions of the book are of especial interest to veterinarians engaged in the practice of meat hygiene.

The book is printed in clear type on good paper and is substantially bound, while the text is illumined with instructive illustrations. The requirement of a second edition in this country is but a repetition of the history of the book in Germany, where the first edition was soon exhausted. L. A. K.

THE PRINCIPLES OF PATHOLOGY. By J. G. ADAMI, M.A., M.D., LL.D., F.R.S., Professor of Pathology in McGill University, and ALBERT G. NICHOLLS, M.A., M.D., D.Sc., F.R.S. (Can.), Assistant Professor of Pathology and Lecturer in Medicine in McGill University, Montreal. Second edition. Vol. I, pp. 1027; 329 engravings and 18 plates. Vol. II, pp. 1160; 301 engravings and 15 plates. Philadelphia and New York: Lea & Febiger, 1911.

A LITTLE more than a year ago the writer published in this JOURNAL a brief note appreciative of Dr. Adami's volume on general pathology, and of the volume on systemic pathology prepared by the same author in collaboration with Dr. Nicholls. Continued use, often daily, in the interim has rather added to his realization of the monumental character of the work; and the additions and occasional

recastings of isolated sections in the second edition, which has been before the profession for the last year, confirm the general impression which the first appearance of the volumes made. It stands to-day as not only the most compendious statement of our knowledge of pathology which has originated from the press of this continent, but also as the most satisfactory and logical discussion of the intricate problems of disease and the most suggestive work upon the general subject which has been presented by any of the pathologists writing in the English tongue. This assertion applies particularly to the first volume, that upon general pathology, in which the principles of the subject are discussed. The application of anything like the same mode of presentation to the multitudinous subdivisions of the systemic part, even were the writers to successfully avoid the indefinite repetitions so liable to occur, would have increased the work to prohibitive size; and the authors seem entirely justified in leaving such application to the reader in large measure.

The general plan of this edition remains unchanged from that of the first. Technical methods have no part in the work; for these the student must consult works on technology. And, particularly in the volume on general pathology, anatomical details appear only as a part of the presentation, satisfactory but succinct; and the real effort of the work lies clearly along the dynamic line, in the setting forth of the problems concerned in the developments of these visible changes, the factors involved, the modes of their influence, and the effects of the established changes. In the volume on systematic pathology this is naturally to a large extent reversed, and the work follows more closely the many excellent existing works descriptive of organic changes, each section, however, having an important introduction devoted to the more prominent physiological problems involved.

The first volume, after a brief chapter of definition and general orientation of the subject matter, takes up at length, as a necessary preparation, the subjects of cell structure and relation, and of the chemical and physical activities of the cell, this leading through cell multiplication into sexual reproduction and inheritance. In this first section of the volume, comprised in fifteen chapters, the author condenses with rare ability our knowledge of living matter, as fundamental to what is essentially a work upon the diseased living body rather than a mere statement of the morphology of the dead remnants of disease. In this section the most important new matter is that dealing with the part played by the nucleus in cellular functions. Briefly stated, the author would grant to the nucleus not only its well known part in maintenance of cellular life and multiplication, but also an important role in cellular metabolism, acquiring material for its own growth and activity from the cell body, and at the same time transmitting substance

to the latter essential to the functional activity of the cytoplasm, whether secretory, neural, motor, excretory or otherwise. The material in the appendix of the first edition upon the classification of the proteins is transferred to an appropriate chapter in the introductory division of this volume. Fuller consideration of the chemistry of the lipoids; material additions to the subjects of fertilization, the contribution of the cytoplasm of the germ cells to the developing offspring, and other matters of inheritance, are notable in this second edition.

The changes in Section II, dealing with the causes of disease, include fuller discussions of such factors as temperature, light and the special light rays, electricity, and nutritional faults. In the third section additional matter and more or less revision are met in the parts dealing with immunity, complement fixation, and the Wassermann reaction; in the recognition of a class of neurinomas, to include the cutaneous neurofibromas; and in the group of the hyaline degenerations, from which the author separates another of the hyaloids under the name elastoid degeneration, referring to the hyaloid masses met not infrequently in vessel walls, as of the arteries of the myometrium of women who have borne children.

In the second volume the major changes appear in the various introductory paragraphs to the different systems and organs, as fuller presentation of the physiological disorders and their results. They constitute in the aggregate, but a minor part of the volume, but are invariably illuminating and valuable. It seems to the reviewer that along this line increasing value for future editions may be accomplished, if necessary, with some sacrifice to descriptive sections. Unquestionably it is this feature which is most urgently required in our texts upon systemic pathology, bridging the gap which is still too apparent between the excellent and numerous works upon morphological pathology and the works upon the application of medical science.

Increase in text-references and in illustration adds materially to the excellence of the volumes; and, although there is evidence of some haste in the preparation of the books in the rather numerous typographical errors, their general appearance is to be commended, the publishers having well supported the authors in their efforts in making a creditable presentation of this magnificent work.

A. J. S.

HYDROTHERAPY. By GUY HINSDALE, M.D. Pp. 466; 145 illustrations. Philadelphia and London: W. B. Saunders Company, 1910.

To those who are familiar with the patient study which the science of hydrotherapy has received from investigators in Germany,

Austria, and in France, it must remain, and probably will forever remain, a riddle why we, of this enlightened Western continent, have persistently refused to recognize the subject. The word "recognize" is advisedly used, and we understand by this term an appreciation of the importance of hydrotherapy with the subsequent application of this knowledge as a remedial measure. We pride ourselves as a nation, on our bodily cleanliness, and the home without the shower or the tub is to us a home unblessed with the Lares and Penates of good health. Why is it that with the recognition given water as a means of preserving health we have failed to support its claims as a curative measure, and have, wittingly or not wittingly, refused to advocate its employment in combating disease?

There can be but one answer to this pertinent query, and that is ignorance on the part of the American physician as to the advantage to be derived from hydrotherapy. It has been employed notably in the treatment of typhoid fever, and in the management of certain kinds of cardiac inefficiences, but with the exception of these two instances and a few minor inconsequential examples the practice is far from universal.

In the work under review Hinsdale has achieved a creditable ambition, namely, to guide the growing practice of hydrotherapy and balneology along rational lines. He has contributed his not insignificant share to this end, and this work reflects great credit on its writer. The book is divided essentially into four parts, although they are not so figured by the author: General hydrotherapy, under which the rationale of the method and its physiology are discussed; special hydrotherapy, which is devoted to a consideration of every disease at all likely to be benefited by the use of waters; technique of hydrotherapy, where are given the multitudinous techniques of applying water; and finally, the internal use of mineral water, a section describing, in a few pages, the internal use of waters in various diseases. In addition to these main headings, there are a few pages devoted to prescriptions for hydrotherapy, and a reprint of an address delivered by Dr. Baruch on "Some Truths about Hydrotherapy."

One of the most pleasant impressions derived from a careful perusal of this book is that hydrotherapy, for its usefulness, does not depend on magnificent marble-lined baths equipped with marble-topped tables surmounted by an armamentarium of brilliantly polished nickel spigots, and supplied with various highly attuned mechanical devises for registering temperature and pressure of the water. These have been the development of the science, but the field of usefulness may still be harvested in a homely fashion by the use of homely inventions with beneficent results.

The author has drawn freely on literature for aid in the preparation of the book, and the illustrations have been gathered from

many sources, making the work broad in scope and adequately rich in pictorial reproductions. Not "to those especially interested" is the valuable volume referred, but to all physicians who seek knowledge regarding this greatest of physiological therapeutic measures, Dr. Hinsdale's book is highly recommended.

E. H. G.

THE SURGERY OF THE DISEASES OF THE VERMIFORM APPENDIX AND THEIR COMPLICATIONS. By WILLIAM HENRY BATTLE, F.R.C.S., Surgeon and Joint Lecturer on Surgery to St. Thomas' Hospital; and EDRED M. CORNER, M.A., M.B., M.C., F.R.C.S., Surgeon in Charge of Out-patients and the Surgical Isolation Wards, to St. Thomas' Hospital. Second and Enlarged Edition. Pp. 291; 100 illustrations. New York: William Wood & Co., 1911.

THE second English edition of this well-known monograph appeared a year ago, the preface being dated April, 1910; and the American edition follows about a year later, as was the case with the first edition (1904, 1905). The volume is larger by nearly one hundred pages, and shows evidence of thorough revision, amounting in many places to complete re-writing.

The authors appear even more certain, than when writing their first edition, of the predominant frequency of chronic lesions, believing that these are the main predisposing factor for acute attacks. An entirely new section has been introduced, discussing the increase in appendicitis in recent years (an increase which they believe is not merely apparent), and suggesting as a cause the almost universal use in civilized communities of wheat ground in rolling mills; the theory is proposed that in such wheat there are contained extremely minute particles of iron or steel, broken off the fluted rollers, and that these, entering the digestive tract, may lodge in the appendix, may there produce an abrasion, and so may create a *locus minoris resistentiæ*, whence infection arises. They say: "A statement was recently made on the authority of an American physician in an English paper that appendicitis was caused by white flour. The reasons given were the following. When white milled flour was introduced into the cities of a certain State appendicitis began to be prevalent, but it was not yet found in the country. As it became cheaper it was introduced into the villages, and appendicitis became common there, yet the negroes escaped. When, however, the flour became so cheap that it was more profitable to buy it than to grind the corn at home, then negroes began to suffer from appendicitis. It must not be forgotten," continue the authors, "that the greater prevalence of appendicitis was heard of first in the United States, from which so much of our flour comes,

before we saw much of it, and it had been a good deal written about over there before the reason for doing so was apparent by any increase of the disease in this country. A few years ago windmills were conspicuous in every landscape in England, and our corn was ground between stones in the districts where it was grown. It can no longer be ground by the old methods at a profit, and flour mills are only to be found in the towns, worked by machinery. Now much of our supply comes ready for the market from beyond the seas, and it is mostly ground up by metal rollers." As a confirmation of this theory the authors quote one case, a patient subjected to operation in 1905, in the centre of a concretion from whose appendix a small piece of iron was found.

Battle and Corner urge operation in all acute cases within the first forty-eight hours, because they believe the total mortality is thus very much reduced; and while they acknowledge that many patients will survive an acute attack without removal of the appendix, they contend that "if operation should be called for after the third day, it cannot but be felt that the case would have been far better treated had it been so submitted earlier." They do not recommend the removal of the appendix in bad abscess cases at the first operation, if it is difficult to find it; but if the appendix is not removed when an abscess is opened, it should be removed as soon as possible after healing of the abscess. They urge earliest possible operation in cases with unlocalized peritonitis; removal of the appendix is the first step; a large incision is advised, with eventration of the intestines and puncture and evacuation of the distended coils. "The advocate of evisceration," they say, "is held up rather as a kind of vivisector who does a dreadful thing. Now, there can be no question that operation in these cases should be performed quickly, and if there is plenty of assistance and warm saline fluid, the parts may be cleansed much more efficiently and in far less time when the bowels are prolapsed than by pulling up the intestine and wiping it in sections; and we maintain," they continue, "that the shock is often less than that produced by the more prolonged operation. Too much time must not be expended in trying to wipe off lymph," etc. *Too much time*, indeed. Why waste any time at all? Why not adopt the American operation for the American disease? Why not get in and get out as quickly as possible, removing the cause of the disease and instituting drainage through a small incision, without evisceration, and without perfectly useless and utterly destructive efforts at cleansing the intestines? We are unavoidably reminded of the caustic saying of the wisest of men: "The beginning of the words of his mouth is foolishness, and the end of his talk is mischievous madness."

Yet useful suggestions in the treatment of peritonitis are the "axillary infusion" of Corner, and the use of a rigid tube for proctoclysis. In the former method a puncture is made with a scalpel in

the skin over the pectoralis major muscle; a trocar and cannula are then thrust through the fibers of this muscle into the cellular tissue of the axilla; this method is advised as easier of execution than intravenous infusion, and as allowing the introduction of larger quantities of saline solution than hypodermoclysis; it is stated that by this method one of the authors has seen two pints of saline solution given and largely absorbed in ten minutes. In giving saline solution by the rectum they recommend the use of a pewter tube one foot in length and half an inch in diameter, having a slightly bulbous extremity, with numerous openings; this is passed into the rectum "for about two to three inches, and is bent sharply at the anus so as to lie easily on the bed." They believe that a rigid tube such as this allows more saline to be administered, as kinking is impossible; and they claim to have no difficulty in introducing by this means at least a pint of fluid every hour.

The use of stock vaccines and sera they characterize as a "shot in the dark," while before autogenous vaccines can be prepared the patient may be dead. Of nucleic acid injections, they say "it may help him to recover, but it will not compel him to recover."

Under differential diagnosis no mention is made of septic renal infarct, though numerous other kidney lesions are discussed; and in the section on the differential diagnosis of peritonitis and intestinal obstruction the value of auscultation in detecting peristalsis is not mentioned.

If this work had been written in Australia or South Africa, the reviewer might be tempted to characterize it as provincial; what to call it when emanating from the centre of civilization, he knows not.

A. P. C. A.

A TEXT-BOOK OF GENERAL BACTERIOLOGY. By EDWIN O. JORDAN, Ph.D., Professor of Bacteriology in the University of Chicago, and in the Rush Medical College. Second edition; pp. 594; 162 illustrations. Philadelphia: W. B. Saunders Company, 1910.

AN index to the satisfactory character of Jordan's Bacteriology is found in the fact that since its first publication in 1908 it has been twice reprinted and now comes forth in second edition. While incorporating the chief of the newer advances in this field, the author has wisely refrained from greatly altering the plan or increasing the size of the book.

The pathogenic microörganisms receive the greatest amount of attention, and the descriptions are, in general, lucid and sufficiently detailed for the purposes of a text-book, though not infrequently lacking in specific points sought by the worker in this field. As

such may be mentioned a more nearly adequate discussion of the pleomorphism of the colon-typhoid group, and a recognition of the close resemblance between the pneumococcus and the streptococcus with the differentiating characters. Chapters on technique and the general principles underlying the subject form the introductory part of the book, and toward the end there is a brief consideration of the pathogenic protozoa, moulds, and fungi, and of the bacteria of water, air, milk, and plant diseases. On the whole, such omissions as may be noted are usually the result of studied scope, and in its field, which is to present in clear, readable, and comprehensive form the essentials of the more important aspects of bacteriology, the book is to be warmly commended. For the student it is unexcelled. D. B. P.

THE MEDICAL RECORD VISITING LIST OR PHYSICIANS' DIARY FOR 1912. Revised edition. New York: William Wood & Co., 1912.

PHYSICIANS have always had the reputation of being poor business managers. This is due partly to the nature of their work and partly to unsystematic methods. Any means, therefore, which will serve to simplify and yet keep accurate the business side of medical work should be gladly welcomed. Many of the methods suggested to-day for the keeping of records of daily visits are too cumbersome and detailed and if tried are soon given up and abandoned. The present edition of the Physician's List for 1912, has met the problem of record keeping in a perfectly simple, accurate, and systematic way. The book is so arranged that rather detailed records of the visits of 60 patients per week may be kept without confusion, and a note made of future visits. In a short printed section in the first part of the book are tables of weights and measures, an extended list of remedies and their maximum doses which is very complete and accurate, methods for treating various emergencies, artificial respiration, and several minor subjects. The book is neatly bound in red leather and is of a serviceable size and shape. F. H. K.

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MEDICAL SCIENCE

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Secondary Infection in Pulmonary Tuberculosis.—ROSWELL T. PETTIT (*Jour. Infect. Dis.*, 1911, ix). The degree of importance of secondary infections in pulmonary tuberculosis is disputed. Some consider the tubercle bacillus as responsible for practically all the pathological conditions of a tuberculous lung; others believe that secondary invaders, more often streptococcus, pneumococcus, or staphylococcus play a large role. Between these two extremes are those who assign a certain importance to both. Previously in attacking the problem, seven methods of attack have been employed—clinical observation, animal experimentation, bacteriological and anatomical examination of lung post mortem, or of sputum ante mortem, study of opsonic indices and of leukocytes, and finally of blood cultures. In reviewing the literature, varying results are reported by different observers. In regard to blood cultures, the findings of which have been long recognized as constituting most direct evidence, the varying results may be explained by technical differences. The earlier observers drew blood from the ear or finger, with a large percentage of positive results; while later workers have used venous blood with a small positive percentage. Pettit has studied 130 blood cultures, using a large quantity of blood (5 to 20 c.c.) from a vein, planting it on the most favorable media, and incubating for at least forty-eight hours. As possible contaminations, he has excluded all growths of any organism but pneumococcus or streptococcus, which he has differentiated by cultural and microscopic appearances, and reaction on serum-inulin agar or in serum-inulin water. As control, he has studied the blood of 21 normal individuals, using the same technique, all with negative results. He has obtained positive cultures in 46 per cent. of 130 cases, growing streptococcus from 36 patients, and pneumococcus from 24. Considering the results from other points

of view, Pettit has found that of incipient cases, 16 per cent. were positive; of advanced, 45 per cent.; and of far advanced, 68 per cent.; of patients with an afternoon temperature below 100°, 34 per cent. showed positive blood cultures, as compared with 58 per cent. in those with higher afternoon temperatures. He concludes that the isolation of pneumococcus or streptococcus from the blood in so many cases shows that not only are true secondary invaders of frequent occurrence in pulmonary tuberculosis, but that often such organisms constitute a complication of great pathological significance.

The Incoagulable Nitrogen of Puncture Fluids, with Special Reference to Cancer.—From recent observations, that malignant tumors contain one or more proteolytic enzymes, ROGER S. MORRIS (*Arch. Int. Med.*, 1911, viii, 457) considered that primary or metastatic growths affecting serous surfaces might secrete their ferment directly into the serous cavity and fluid occupying it. That in those fluids resulting from pressure on vessels there should then be an absence of this ferment. In certain cases, therefore, there might well be an increase in the incoagulable nitrogen. With this idea in view, Morris has examined 25 fluids, removing the coagulable proteins according to the method of Hohlweg and Meyer, slightly modified. This consists, in brief, of precipitating the proteids by a reagent of acetic acid and monocalcium phosphate, and sodium chloride, and testing the filtrate for nitrogen by Kjeldahl's method. From the literature and his own cases, Morris has selected 78 observations. The fluids are divided into three groups according to their content in incoagulable protein, the nitrogen being expressed in grams per cent. Group I contains incoagulable nitrogen of 0.0699 gram per cent. or less; Group II, 0.07 to 0.0899 gram per cent.; and Group III, 0.09 to 0.1 gram or more per cent. Morris concludes that in analyzing these groups with reference to cancer, Group I contains 4 of cancer out of 59 fluids; Group II, 2 cases of cancer out of 5; and Group III, 3 of cancer out of 4. It thus appears that a puncture fluid with incoagulable nitrogen below 0.07 gram per cent. is probably not of malignant origin; while a very high percentage of incoagulable nitrogen is, to say the least, a suspicious circumstance.

Nephritic Edema.—P. SCHMID and SCHLAYER (*Deutsch. Arch. f. klin. Med.*, 1911, civ, 44) have made an experimental study of nephritic edema in rabbits. It had previously been shown that two types of experimental nephritis could be differentiated, not on anatomical but rather on functional grounds. The one presents a severe lesion of the tubules with secondary affection of the circulatory apparatus—"tubular" nephritis. The second variety, the "vascular," is characterized by a rapid and intense injury to the renal vessels. In these two types of experimental nephritis the present observations were made. Their purpose was not to study the role of the kidneys themselves, but rather to determine the part played by prerenal factors, namely, the functional activity of the bloodvessels of the body and that of the tissues. The method of approach was as follows: Hyper- and hypotonic solutions of sodium chloride were injected subcutaneously. The hemoglobin and blood chlorides were determined before, immediately after the

infusion, and again at the end of one-half an hour. To eliminate diuresis as a factor, and to throw the full burden on the circulation and tissues, only those nephritic animals were used which had become completely anuric. Preliminary observations were made on (1) normal animals, (2) on those whose ureters had been ligated, and (3) on nephrectomized rabbits. To produce tubular nephritis, they employed potassium chromate; vascular nephritides were caused by arsenic, cantharidin, and uranium. The results which Schmid and Schlayer report cannot be given in the detailed form which their importance would seem to warrant. Briefly stated, they are as follows: The distribution of salt and water between blood and tissues differs when the kidneys are mechanically removed from the conditions found in experimental nephritis. In purely mechanical removal of the kidneys, the adjustment following injections of salt solutions is abnormally delayed; the blood retains unusually large quantities of water and salt. In the nephritides, the distribution of the injected solution varies according to the kind of nephritis under consideration. In the tubular nephritides (potassium chromate) one sees the same accumulation of water and salt in the blood that occurs in nephrectomized animals, but at the end of the experiment practically all of the solution has passed from the blood into the tissues. Here, then, there is an alteration in the sense of a slightly increased permeability of the vessels, following the primary collection of both water and salt in the blood. In the vascular nephritides (produced by arsenic, cantharidin, and uranium) the conditions are quite different. With increasing intoxication there is observed a correspondingly marked inability on the part of the vessels to retain water and salt in the blood; there is a total inability on the part of the vessels to remove the fluid from the tissues; finally, the permeability of the vessels for water and salt becomes so great that the infusion of salt solutions of high concentration no longer produces any change in the composition of the blood. These facts support the view, Schmid and Schlayer believe, that nephritic edema is caused through the coördination of a vascular lesion with an alteration of the body tissues. It is impossible to say whether the vascular condition is primary or whether both vessels and tissues are equally affected by the nephritic toxin.

On the Bence-Jones' Body.—R. Massini (*Deutsch. Arch. f. klin. Med.*, 1911, civ, 29) reports investigations made on a patient whose urine contained Bence-Jones' protein. Three lines of study were followed, and it was found (1) that a certain parallelism exists between the quantity of protein taken with the food and that of the Bence-Jones' body in the urine. This, therefore, points rather to a transformation of the food proteins into Bence-Jones' protein than to a production of the latter from marrow or tumor cells. (2) By means of deviation of complement with highly potent sera, it was possible to show definite quantitative differences between blood serum and Bence-Jones' protein. (3) Studies of the solubility of pure Bence-Jones' protein showed that the concentration of salts and acid determine largely its precipitability. Slight changes in concentration suffice to produce marked alterations in its coagulability. In this way Massini explains the contradictory reports in the literature on the more or less complete solution of the precipitate on boiling the urine.

SURGERY

UNDER THE CHARGE OF

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The X-rays in Renal Tuberculosis.—VON LICHTENBERG and DIETLEN (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1911, xxiii, 739) in 11 cases of renal tuberculosis, showed the urinary path by the *x*-rays and the injection of a collargol solution. In the 8 unilateral cases nephrectomy was performed and the *x*-ray findings controlled by those of the extirpated kidneys. Of the 3 bilateral cases, in one a nephrotomy was performed. The radiographing of the renal pelvis or pyelography is beset with certain difficulties, although for the most part they can be overcome. The method stands or falls with the passage of the ureteral sound, which is often difficult or may be impossible. There is further difficulty in evacuating the kidney. The pelvis and calyces are filled with pus and caseous debris, as well as the tuberculous cavities which open into the calyces by a very narrow communication. In such cases the ureteral catheter must be left in longer (up to an hour) before the taking of the *x*-ray. Repeated aspiration aids, and a concentrated collargol solution should be employed, as it will mix itself with the caseous material and permit a fair shadow. If the collargol solution is introduced before the pelvis is evacuated, the shadow will not be clear. The collargol was usually employed in a 10 per cent. solution. The results of its use show that in many cases the diagnosis of renal tuberculosis is corroborated, and in many it is established, by this method. The radiograph produced is a typical one for this disease, and gives a fairly exact outline of the anatomical area affected.

Concerning the Pathogenesis of Acute Pancreatic Diseases.—PÓLYA (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1911, xxiv, 1) undertook to determine by experiments on dogs whether the albumin digesting pancreatic ferment, trypsin, can produce pancreatic diseases; and whether substances having a digestive action on albumins can do likewise. He found that trypsin solutions, having a powerful digestive action on albumins, as well as active pancreatic secretion, when injected into the pancreas, produce severe changes in the gland, such as hemorrhage, necrosis and its consequences, fat necrosis, and death. Inactive fistula secretion and weak or inactive trypsin solutions do no damage to the pancreas. Even strong trypsin solutions lose their pathogenic effects from being heated. The disease-producing agent is the proteo-

lytic trypsin. From the injection of intestinal contents, especially contents of the duodenum, into the pancreas, there were produced in a large number of dogs acute pancreatic necrosis and hemorrhages with fat necrosis; while in another group there developed cases of chronic interstitial pancreatitis. The effects of the intestinal contents and extracts of the mucous membrane were due chiefly to the bacteria cultures and bile mixed with them, which stimulated the pancreatic secretions. Upon the trypsin depended the disturbance of the gland and its deleterious effects. The valves at the opening of the pancreatic duct into the duodenum could hardly admit enough duodenal contents to produce the necessary stimulation of the pancreatic secretions. The damaging effect is, therefore, produced most surely by the trypsin solutions; less by the duodenal contents and bacteria-bile mixture; rarely by the contents of intestinal fistulæ; and only exceptionally by bacteria alone. The gap between the pancreatic ferment theory and the microparasitic theory is bridged by the recognized influence of the bacteria. Both theories, as well as the results of the pathologico-anatomical, clinical, and experimental investigations, will be brought into accord by the conception that the pancreatic destruction in acute pancreatitis is due to autodigestion of the gland, this being due chiefly to the action of the bacteria.

Immediate and Remote Results of Fifty-seven Nephrectomies for Renal Tuberculosis.—Boeckel (*Ann. d. mal. d. org. gên.-urin.*, 1911, ii, 175) reports an interesting and detailed study of 57 nephrectomies performed by Andre, which were followed carefully for varying periods up to nine years. There were 31 males and 26 females; the youngest was aged thirteen years, the oldest, fifty-four years; the right side was involved 28 and the left 29 times. The kidney was primarily involved, at least clinically, in a large number, and when the genital apparatus was attacked, it was for the most part secondarily to the kidney. The nephrectomy was performed by the lumbar route 56 times, and only once by the transperitoneal route, in which case the operation was primarily done for a probable ovarian cyst, but an ectopic tuberculous kidney was found. In 5 cases the nephrectomy was secondary, one ten years after an operation for renal calculus, and in the 4 others after nephrotomy for pyonephrosis, the interval between the nephrotomy and nephrectomy being from a month to seven weeks. In 15 cases the nephrectomy was a subcapsular one, because of intense perinephritis, the perinephric fat being extirpated as freely as possible. A general uterectomy was not done, the ureter merely being drawn into the wound and divided as low as possible with a thermocautery. The immediate operative results were 55 cures and 2 deaths, one being independent of the operation and the other due to a general tuberculous infection six weeks after the operation. After a transient oliguria, following the operation, the quantity of urine rapidly returns to the normal in most cases, and in a few there is polyuria. Free drainage was always employed. The wounds were closed in from fifteen days to twenty months after operation. The best results in hastening the closure of tardy fistulæ were obtained with Beck's bismuth-vaseline paste. There were 9 secondary deaths. One patient died two and one-half years after the nephrectomy, which had been followed by much

amelioration of the disturbances, the patient dying of pulmonary and intestinal tuberculosis. Another died at the end of five years from uremia. The autopsy showed an atrophic nephritis of the remaining kidney, which as well as the bladder were tuberculous. The 7 others died within a year after operation, the disease having existed in all a long time before, making them unfavorable cases. Only one of these was autopsied, and showed a pulmonary tuberculosis. Of the remaining 46 cases, 5 were only transiently ameliorated. The other 41 were much improved or were completely cured. All have been examined recently or have been heard from. In 7 the operation had been done from five months to a year; in 15 from one to two years; in 12 from two to four years; and in 7 from four to nine years. They are all in a much improved general condition, and all have gained weight, one as much as 30 kilograms. Many have returned to their work, sustain fatigue, and one has, without inconvenience, gone through a period of military service. In 31 of the 41 pain in the bladder has disappeared completely, in 8 it is much ameliorated, and in only 2 is it only slightly ameliorated. In nearly all there is an increased capacity of the bladder. In many cases it was found that the tuberculous lesions had completely disappeared, in some shown by a cicatricial condition of the ureteral meatus, and in others by the completely normal condition of the bladder. In 24 of the 41 cases the urine became completely clear, in 9 it was turbid, and in 8 not completely transparent. In 12 of the 41 pus was found in the urine by the microscope, and in 26 no pathological elements. Briefly, the results show 2 operative and 9 later deaths, 4 mild ameliorations, and 41 positive ameliorations and cures.

Bacteriological Examination of the Blood in Anthrax.—Becker (*Deut. Zeits. f. Chir.*, 1911, cxii, 265) says that in every fatal case of anthrax the bacilli of anthrax can be found in the blood in life. In every body dead of anthrax they can be found in large numbers. Their presence in the blood gives a bad prognosis. Of 11 cases in which the bacilli were found in the blood, 9 died. One was saved by giving salvarsan intravenously. To determine the value of a method of treatment (*e. g.*, by serums) a bacteriological blood control is necessary, since severe cases with negative blood findings heal spontaneously. The results of the bacteriological examinations of the blood speak for conservative as against operative treatment for malignant pustule.

Experimental and Literary Studies Concerning Extensive Resections of Small Intestine.—Soyesima (*Deut. Zeits. f. Chir.*, 1911, cxii, 425) says that there are many opinions as to how much intestine may safely be removed in man. He did resections of the intestine on 11 dogs in an effort to solve the problem. In an extensive resection, the severity of the operation is best determined by the relative length of the resected portion than by the absolute length, since the total length of the jejuno-ileum is very variable. Brenner's case, in which 83.6 per cent. of the small intestine was removed, is the most extensive successful resection on record. Under favorable circumstances one can resect in dogs up to 90 per cent. of the total length of the jejuno-ileum without great disadvantage. From clinical experience and

experimental results, Soyesima believes that the resection of up to 80 per cent. in man, is a permissible operation. A compensatory hypertrophy or dilatation of the remaining intestine usually occurs in those animals which withstand the operation well, while it does not occur in those which do not long outlive the operation. Distinctions as to prognosis, according to the segments of the intestine removed, were not demonstrable.

THERAPEUTICS

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.,

PROFESSOR OF APPLIED THERAPEUTICS IN THE COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY, NEW YORK.

The Treatment of Quartan Malaria with Salvarsan.—REICH (*Therap. Monatshefte*, 1911, xxv, 594) reports a case clinically diagnosticated as quartan malarial fever that yielded promptly to an injection of 0.6 gram of salvarsan. This patient had reacted only slightly to treatment with quinine. The symptoms have not recurred in a period of four months' observation after the injection.

Soy Bean Cookery.—RUHRÄH (*Med. Record*, 1911, lxxx, 626) gives a number of recipes for the preparation of the soy bean that are especially adapted for diabetic patients. The soy bean is an annual leguminous plant that is extensively used in China and Japan, where it has been a staple article of food for centuries. It has great nutritive value, being especially rich in fat and protein content. The fact that the soy bean has only a small percentage of cane sugar in its composition makes it most valuable in the dietary of diabetics. The beans may be cooked in soups, baked, or boiled with salted meats, etc. It is a good plan to first soak the beans for eight or ten hours, after which the firm outer skin will separate and can be removed easily. A flour has also been manufactured from the bean that may be prepared in a great variety of ways. Ruhräh gives recipes for utilizing this soy bean flour in gruels, soups, muffins, nut cakes, pan cakes, etc.

The Practical Application of a Salt-poor Diet.—LEVA (*Med. Klin.*, 1911, vii, 1582) gives a long list of various seasonings that may be used to replace the lack of salt in a salt-poor dietary. Among these are mint, thyme, capers, onions, celery, cress, lemon, vinegar, mustard, caper sauce, tomato sauce, and mayonnaise. He also says that the free use of sugar and cream enables patients to dispense with salt to a considerable extent. Leva has experimented with the substitution of sodium bromide for salt in the seasoning of bread, eggs, soups, and vegetables. It does not taste like salt, but the patients can apparently dispense with salt more easily when it is given than without its use.

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He does not believe that any harmful action will result from giving amounts of from 1 to 2 grams of sodium bromide a day. His experiments proved that sodium bromide increases the elimination of sodium chloride, and thus indirectly of dropsical fluid. Therefore the addition of sodium bromide to the diet serves to aid the dietetic treatment of dropsical conditions.

Clinical Results of the Treatment of Gout and Other Joint Affections with Radium Emanations.—GUDZENT (*Berlin. klin. Woch.*, 1911, xlviii, 2098) has treated a number of cases of gout and chronic arthritis, due to various causes, with radium, and believes that this method of treatment is based upon true rational therapeutics. The most notable result of the treatment of gout by radium, in addition to the clinical improvement, was the effect observed in diminishing the amount of uric acid in the blood. In a majority of the cases the uric acid completely disappeared from the blood in a comparatively small number of treatments. Gudzent believes that the radium treatment promotes the solubility and destruction of urate deposits in the body, and he also assumes that the radium has a stimulating action upon the function of the tissue enzymes. Gudzent says that radium is best given by inhalation, and he gives details of the proper dosage and method of administration. He thinks that a purin-free or purin-poor diet is often a valuable aid in the treatment of gout, but it is impossible to rid the blood of uric acid by dietetic measures alone. Therefore, he would not subject patients to the hardships of a purin-free diet, but would exercise certain limitations in the diet as determined by the individual case. It is not important to continue a purin-poor diet if no effect is observed from its continued use over weeks or months. He advises the addition of colchicum or atophan to the treatment during acute attacks of gout. Mild and moderately severe cases of chronic progressive polyarthritis, especially the variety occurring in children, were very favorably influenced by this treatment. The emanations have little or no effect when the joint process has reached the stage of marked deformity or ankylosis. No effect of the treatment was observed in joint affections due to syphilis or tuberculosis, but gonorrheal arthritis was often considerably improved. Gudzent says that it is often a good plan to combine the treatment by radium emanations with local injections of soluble radium salts in the neighborhood of the affected joints. The employment of local dressings wet in radio-active solutions will often relieve pain and tend to hasten the cure.

The Influence of Treatment on the Wassermann Reaction in Syphilis.—MATSON and REASONER (*Jour. Amer. Med. Assoc.*, 1911, lvii, 1670) believe that the Wassermann reaction not only reveals the nature of the disease, but it serves as a guide for individualizing treatment. It has shown the necessity of more energetic and individual treatment than has been the custom heretofore. Fully half of the patients discharged as cured are only half way to their goal, and in reality are latent syphilitics. The early administration of mercury may cause a disappearance of manifestations, with little influence on the spirochetes, the organisms remaining latent for years, and under

favorable conditions renewing their activity with reappearance of manifestations. A positive reaction may be made to disappear by energetic, specific treatment, and this sustains the conclusion that a positive reaction means active syphilis, even though there be no other evidence, and speaks for renewal of treatment. Patients who have been well treated give negative reactions, whereas those poorly treated give positive reactions even years later. The number of inunctions or injections of mercury or salvarsan injections necessary to convert a positive into a negative reaction varies with each patient, and should be controlled by the blood examination. A positive reaction in tabes is little affected by treatment. If mercury is used, systematic and consecutive treatment is necessary, and this should be begun early, and during the first year no lapses of over one month permitted, or much that has been gained will be lost. The use of alcohol has a bad effect on syphilis, predisposing to secondary and late manifestations, and, to a certain extent, nullifying the treatment. In patients recently treated by mercury, and giving a positive reaction, the time required for a negative Wassermann with salvarsan may be much reduced. In very recent cases, or older cases not under the influence of mercury, there may be no shortening of the time. In cases of a mercury-produced Wassermann negative at the time of injection, the reaction will generally revert to a plus-minus, or in some cases to plus, and then at varying intervals go back to negative, from which subsequent injections may not change it. This is suggested as a possible diagnostic procedure in cases in which the question of a cure is open to doubt and it is not desired to suspend treatment if the infection still persists. The intravenous method of giving salvarsan is to be preferred to others as being easier, more efficacious, less painful and requiring less time on the part of the patient. At least two injections should be given, and more if indicated, and these injections should be given about a month apart. An otherwise healthy adult will take from 0.5 to 0.6 gram intravenously without bad effect. Unless one is prepared to maintain a very thorough watch over the patient, the salvarsan treatment should be reënforced with mercurial medication, and in any event better results will be obtained thereby. Matson and Reasoner believe that a positive Wassermann is a sign of active syphilis, irrespective of clinical manifestations. They have observed that there has been a return of the reaction from negative to a partial-positive or positive reaction in 22 per cent. of cases under observation for seven months. This may be explained by insufficient treatment or by the fact that a persistent negative reaction could not be obtained in alcoholics even when the treatment was energetic. A certain number of syphilitics have a constant positive Wassermann reaction in spite of the most active treatment. This fact points to an unfavorable prognosis, and it is thought that many of these patients subsequently develop paresis and ataxia.

The Treatment of Pleurisy.—ARNSPERGER (*Therapie d. Gegenwart*, 1911, lii, 495) reports in detail 7 uncomplicated cases of pleurisy with effusion, and 4 complicated cases treated by early aspiration of the effusion followed by the injection of from 150 to 600 c.c. of nitrogen into the pleural cavity. He believes that both pleural adhesions

and a return of the pleural exudate are prevented by this method. The amount of nitrogen introduced into the pleural cavity must not be large enough to cause any compression of lung substance, and consequently it is better to control the amount injected by a fluoroscopic examination at the time of injection. The procedure had to be repeated two and three times in 3 of Arnsperger's cases, but no untoward effects were observed from these injections. Arnsperger also combined this method with autoserotherapy, injecting subcutaneously from 1 to 3 c.c. of the patient's own exudate as the needle was withdrawn from the pleural cavity.

PEDIATRICS

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.,

OF PHILADELPHIA.

Secretion of the Mammary Glands in Infants an Index to the Mother's Nursing Power.—K. BASCH (*Münch. med. Woch.*, 1911, lviii, 2266) calls attention to the fact that there occurs in infants a secretion of milk from the mammary gland similar to that occurring in the nursing mother. This activity of the mammary gland occurs in both male and female infants, and the secretion morphologically shows the same elements as mothers' milk—free fat droplets and white blood cells. The most plausible explanation for this secretion in the newborn child is advanced by Knöpflemacher, who holds it is due to a physiological process, and that the same stimulus which starts the mother's milk secretion also starts that of the child. He was unable, however, to verify this by animal experimentation. By injecting extracts of embryos, endometrium, and ovaries from pregnant animals into virgin animals, a proliferation of the mammary gland substance was demonstrated, but never a secretion of milk. The author, however, has been able to accomplish this by injecting placental extract into non-pregnant animals, which had, however, been pregnant at some previous time. The same result, in lesser degree, was obtained in animals which had never been pregnant before. In all these cases of milk secretion, however, there was no accompanying mammary hyperplasia, such as occurs physiologically during lactation. This hyperplasia was finally accomplished by implanting an ovary from a pregnant animal into a non-pregnant animal. The hyperplasia, plainly apparent and proved by microscopic tests, followed the course usual to a pregnant animal of that species; but when the maximum was reached secretion of milk was not forthcoming. If then placental extract was injected, the milk secretion appeared. Therefore Basch concludes that the mammary hyperplasia in pregnancy is set up by stimulating substances arising in the ovary, while the incidence of the milk secretion is caused by similar substances arising from the matured placenta. Basch applied

this explanation to the problem of milk secretion in infants. By using placental secretion on infants in which a preceding mammary secretion had normally disappeared, he was able to stimulate the milk secretion again. While Henoch and other authorities state that the mammary secretion begins usually on the fourth day and ends about the twentieth day after birth, Basch has frequently seen the secretion in infants three, four and one-half, and five months old. By comparing the degree of mammary reaction in a large number of infants to the quality and the supply of the mother's milk, Basch has found that there exists a parallel between the two. So that, in general, an early and free mammary secretion in the infant prophesies an accompanying rich and sufficient maternal milk secretion. This fact was apparent in a series of 100 cases especially studied. A weak or absent reaction in the infant, however, does not imply, with as much certitude, a weak or failing maternal supply.

The Standard Role of the Salts in Mother's Milk in Infancy and Childhood.—HANS FRIEDENTHAL (*Münch. med. Woch.*, 1911, lviii, 2385) remarks on the growing disinclination of women to nurse their infants, with the result that in Germany, at least, only a small and constantly diminishing percentage of infants get the benefit of mother's milk during the first nine months of life. In the necessary substitution of nourishment for mother's milk the most important factor—that of the proper combination of the salts—has been very little emphasized. Cow's milk, fortunately, comes nearest to human milk in its salt content. The standard of absolute ash-content in milk is the rapidity of skeletal growth. Human milk contains the least percentage of ash, since the growth of the human skeleton is the slowest of all skeletal animals. Therefore, within physiological limits, a milk rich in ash will stimulate skeletal growth and vice versa. The salts of calcium especially, and of iron are important factors in this connection. Different specimens of human milk differ in 50 per cent of cases in their ash content, but show considerably less difference in the proportion of their salts. Cow's milk, to have the same proportion of calcium as human milk, must be diluted more than five times. But with this dilution the proportions of sodium and potassium are reduced 4 per cent. and 31 per cent. respectively, below those of human milk. So that in practice it is impossible in any way to get the same proportion of salts in cow's milk by dilution. Only by the addition of the deficient elements can the difference be equalized. If there is a deficiency of one important inorganic element such as potassium, for instance, no other salt in any proportion can make up for or take the place of the deficient element. The loss of 3 mg. of iron from a liter of infant's nourishment continually would mean a slow but inevitably fatal result. The proper proportion of inorganic elements in an infant's nourishment is, therefore, of the first importance. Friendenthal believes it is of the greatest importance, practically to exhibit the salt content of human milk in the child's nourishment, not only during the first months of life, but during the entire physiological suckling stage of three years. A system for its practicable application is highly desirable.

OBSTETRICS

UNDER THE CHARGE OF

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Double Congenital Dislocation of the Hip and Its Effect upon the Pelvis.—DELMAS (*L'Obstétrique*, August, 1911) gives the results of his studies of 17 pelves with double congenital dislocation at the hip-joints. In these cases the pelvis is tipped very strongly forward, but is not uniformly narrowed except above the brim of the true pelvis. The actual pelvic brim is somewhat enlarged transversely, as is the case with the pelvic cavity below the brim. Occasionally in these cases the whole pelvis suffers from general atrophy. The pubic arch is usually wider than normal. The sacrum is pushed upward and back, and the pressure of the thigh bones separates the ilia, making the crests straight and the intercrest diameters about 22 cm., and the distance between the spines 22.5 cm. The outlet of the pelvis is larger than normal, especially transversely, and this is true the older the patient, possibly due to the thinning of the pelvic bones. The pelvic cavity is made larger, and those diameters which are most increased at the brim are the transverse and oblique. The same thinning process is seen in the wings of the ilia, and many of the bony lines of the pelvis are poorly marked. The abnormalities found in the pelvis in these cases seemed to result from the absence of the force normally transmitted through the necks of the femora.

Pituitrin as a Stimulant in Labor.—STERN (*Zentralbl. f. Gynäk.*, No. 31, 1911) gave pituitrin in doses of 0.6 gram in prolonged labor as a stimulant to uterine contraction. In these cases he is in the habit of giving a prophylactic dose of some preparation of ergot after delivery, to avoid possible relaxation and postpartum hemorrhage. Labor may also be induced in some cases by giving pituitrin. In a patient with tuberculosis of the larynx and lungs, 0.6 gram was given at the thirty-sixth week of pregnancy, followed by gradual development of the first stage of labor. The injection was repeated with further progress, and two others were finally given, followed by normal expulsive contractions and the birth of living twin children, mother and children making a good recovery. In another patient suffering from nephritis there were threatening symptoms of eclampsia at the thirty-ninth week. During four days, six injections of pituitrin, 0.6 gram, and one of 0.1 gram, were given, followed by spontaneous normal labor. In another case of severe tuberculosis pregnancy was terminated at the end of eight months, and two doses of 6 cm. failed to produce pains. Then 1 c.c. was given seven times, followed by weak and deficient contractions for a few hours. An injection of 3 c.c. produced no better effect. A bag was then inserted for six and one-half hours without result. One cubic centimeter of pituitrin was then given, and the pains became

vigorous, and after eleven hours the bag was expelled, followed by the child in breech presentation. In these cases the uterine contractions were not of the tonic variety. There was always an interval between the pains, so that no injury to the fetus resulted. It seems especially valuable in cases of nephritis with threatened eclampsia. In two cases of pregnancy in the early months pituitrin failed to produce abortion. In one patient with incomplete abortion it caused uterine contraction.

Pregnancy Complicated by Acromegaly.—Marek (*Zentralbl. f. Gynäk.*, No. 47, 1911) reports the case of a primipara aged twenty-six years. In childhood she had measles and scarlet fever. Menstruation began at twelve, and was normal. The first half of pregnancy passed without disturbance. At about the eighth month the patient felt as if her clothing had become much too tight. The fingers became so thick that her rings could not be worn. Pain developed in both lower extremities; the patient was weak, drowsy, and very thirsty. The quantity of urine was gradually increased. The face was greatly altered, the nose and lips increasing very evidently in size. There was no headache or disturbance of vision. The patient developed also coryza and hoarseness. On examination there was no exophthalmos, but the nose was greatly enlarged, broad, and very hard. The lips were thickened and projected outward. The tongue was thickened. the lower jaw projected beyond the upper, the teeth closing badly. The thyroid could be palpated as somewhat enlarged; both tonsils were enlarged and reddened; the thoracic viscera seemed normal. The pulse was 120, strong, and full. The hands were greatly enlarged, apparently by thickening of the tissues, the skin seeming to be infiltrated and very hard. So far as could be made out, there was no alteration in the bones of the fingers. A similar condition existed in the toes, while the skin of both lower extremities was thickened. Edema, however, was absent. The fundus of the uterus was three fingers' breadth above the umbilicus, the fetus in second position, and the head presenting. The urine contained no albumin, but gave a very positive reaction to sugar. The patient went on for some time, feeling fairly well, without any especial alteration in her condition. The membranes ruptured and very slight pain developed, which after some days became vigorous. The head failed to descend, the heart sounds became irregular, the caput increased, and the patient was delivered by forceps. The placenta was readily delivered. The child cried lustily. After delivery the patient's temperature rose somewhat, the pulse was 128 and strong. During the first few days of the puerperal period the patient was depressed, and especially complained of great thirst; up to the eleventh day the urine gave a positive reaction for sugar. The pulse gradually became less frequent, and on the eighteenth day the patient got up. She complained of pain in both lower extremities and in both hands. The symptoms of acromegaly gradually disappeared during the puerperal period—the thickening of the skin in the lower extremities—and the intense thirst passed away within the first three days after confinement. The face slowly assumed its normal condition, and the nose and lips ceased to be enlarged. There remained, however, deformity of the lower jaw, and the teeth did not close properly. The abnormalities in the fingers and toes remained the longest, and the

patient could not wear her rings for some months after her confinement. The sugar gradually disappeared from the urine without any modification in the patient's diet. The patient nursed her child, and the child did well. Marek considers this a case of increased action and secretion of the hypophysis, with increased adrenal secretion also. He remarks that cases of pregnancy having sugar in the urine may be divided into three groups: In one the sugar is milk sugar, which is very constantly found. In a second group the sugar is not milk sugar, but its presence in moderate quantity is not accompanied by a disturbance in the patient's health. Before conception occurred these patients had no sugar in the urine, and it disappeared soon after confinement. In a third group of cases, the patients have sugar in the urine before conception occurs, and it persists throughout the gravid state. The reviewer has recently had under his observation an interesting case of toxemia, accompanied by the prolonged presence of sugar in the urine. At the latter portion of the sixth month a multipara became drowsy, weak, and complained of excessive thirst. The urine showed a considerable percentage of sugar, with casts and albumin. There was some nausea and headache. There were also slight uterine contractions which threatened the interruption of pregnancy. These symptoms gradually subsided in severity under careful diet and constant and skilled nursing. In spite of a vigorous hygiene the urine did not become normal. The patient delivered herself at two hundred and ninety days of a living child, weighing 8.5 pounds, who shared in some degree the symptoms of the mother. The child's hands and feet were swollen soon after birth, its urinary secretion was deficient and highly colored, and its intestine contained much dark and disintegrated matter. Both mother and child improved steadily after birth.

The Mortality of Parturition.—UNTERBERGER (*Archiv f. Geburts. u. Gynäk.*, 1911, Band xcv, Heft 1) has endeavored to classify those conditions which most frequently cause mortality in parturient women. These statistics are gathered from a portion of the German Empire. He finds that 1 death in 488 births occurs from puerperal septic infection; 1 in 1480 births from tuberculosis; 1 in 1948 from eclampsia; 1 in 3454 from embolism; 1 in 3759 from postpartum hemorrhage; 1 in 4291 from placenta prævia; 1 in 8170 from nephritis in pregnancy; and 1 in 10,892 from atony and shock.

The Pelvic Kidney.—In the *American Journal of Obstetrics*, October, 1911, Bissell, of New York, contributes a second paper upon this interesting subject. From 1910, he reported the case of a patient whose pregnancy was complicated by dislocation of the kidney into the pelvis; and he adds other cases in his experience, aggregating 3 in all. These conditions may require Cesarean section at the time of labor, and can be successfully dealt with by a plastic operation, which in one or more steps replaces the kidney to nearly its normal position. The obstetrician must not lose sight of the fact that a pelvic tumor complicating labor, and obstructing delivery, may be a dislocated kidney, and that such a tumor should not be removed until no doubt exists concerning its nature. If it be the kidney, delivery should be effected by Cesarean section and the kidney replaced.

GYNECOLOGY

UNDER THE CHARGE OF

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Endometritis.—An attempt to gather together and unify the modern consensus of opinion on this much discussed subject is given in a recent article by ALBRECHT (*Monatsschr. f. Geb. u. Gyn.*, 1911, xxiv,, 397). The general principles of Hitchmann and Adler's work have been confirmed, he says, though the cyclic endometrial changes cannot be quite as sharply classified as those authors wish. The endometrium is subject to periodic changes due to the internal secretory activity of the ovaries, but the individual type of these periodic changes varies greatly. In principle it consists in an increase in the vital function of the corpus glands, evidenced by an increase in the volume of the epithelium, hypertrophy of the glands, and increased secretion, especially in their basal portion. The stroma takes part in the process by undergoing a decidua-like change. The development of these menstrual glands occurs irregularly in the uterus, and they do not all collapse and empty their secretion during menstruation, as Hitchmann and Adler claim, but some of them can persist throughout. This irregularity is due to the fact that the periodic functional activity of the ovaries, and also the responsiveness of the endometrium, are variable. It is, therefore, impossible to judge of the exact phase in the individual case from the appearance of the endometrium. Since "endometritis" means merely an inflammation of the uterine mucosa, and since the chief changes take place here in the stroma, the term "interstitial endometritis" is tautological, and should be given up. Etiologically endometritis may be divided into (1) bacterial, (2) toxic (due to chemical substances, necrotic tissue, toxins of infectious diseases, etc.), (3) mechanical and thermal. Since, however, all these causes produce identical conditions in the endometrium, a different classification is necessary for practical purposes. The most satisfactory from this point of view is that into (1) acute, (2) chronic, and (3) specific. In acute endometritis the alterative and exudative changes predominate over the proliferative. There is cloudy swelling, desquamatiom, even necrosis of the epithelium, swelling and increased secretion of the glands, as in all inflammations. Active hyperemia is present, with escape from the vessels of serum and leukocytes. The increased quantity of leukocytic infiltration in the tissue is the chief criterion of inflammation. Other infiltration cells (lymphocytes, plasma cells, etc.) are in the background as compared to the leukocytes in acute endometritis. This condition may heal or become chronic; that it so often does the latter is due to the unfavorable conditions for healing presented by the recurring increase in congestion and functional activity of the endometrium at each menstrual period. In chronic endometritis we have much less exudation of serum, or none at all; the cellular infiltrate

consists chiefly of round cells, with some plasma and mast cells, but few leukocytes. The plasma cells, while usually present, are not characteristic for chronic inflammation, however, as they may be absent, and, on the other hand, they can occur without inflammation. Here the proliferative changes are the importnat ones. There is an increase of connective tissue in the stroma, especially around the bloodvessels. Atrophic and hypertrophic areas may alternate. The bloodvessels show tortuosity, thickening of the walls, proliferation of the endothelium. The surface epithelium may take on a many-layered character, and become squamous in type. The glands show proliferation, with increased activity, and may extend deep down into the myometrium. Under specific endometritis are classed tuberculosis and the few definitely demonstrated cases of syphilitic endometritis. The diagnosis "endometritis" is only to be made when all the complex of tissue changes associated with inflammation are present; all the hyperplastic conditions without inflammation, formerly described as "endometritis glandularis hyperplastica," are to be considered as pure hypertrophies. They have nothing to do with inflammation, but the symptoms of both may be practically identical.

Electricity in Gynecology.—PETTIT (*Rev. pratique d'obst., de gyn., et de péd.*, 1911, No. 7, p. 193) emphasizes the value of electricity in conservative gynecological therapeutics. Its chief action is hemostatic; indeed, the rapidly interrupted, tetanizing faradic current is such a rapid and sure hemostatic that it is suitable for use in emergencies to stop a sudden hemorrhage. For the permanent cure of hemorrhage, however, the constant current should be used, this being applied to the interior of the uterus. It has a caustic action, causing coagulation of the blood and destruction of the mucous membrane, resembling the action of the thermocautery. It has also a decided excitomotor action on the muscle fibers of the uterus, which, of course, increases its hemostatic effect. When an intra-uterine electrode of copper, zinc, or silver is used, and is made the positive pole, as it should be in treating hemorrhage, it can be demonstrated that ions of these metals are driven off into the mucosa, and exert there their coagulating and hemostatic effect as well. This form of treatment is applicable to many forms of hemorrhage, but it is especially valuable in the metrorrhagias of young women, in whom curetting leads to but temporary improvement. The action of electricity on fibroids seems to be rather irregular and uncertain; for these *x*-ray treatment seems to offer better results. The electric current, in addition to its hemostatic and excitomotor properties, has analgesic, bactericidal, and disinfectant actions, and is, therefore, of great use in treating leucorrheas. In cases of amenorrheas due to infantile uterus, Pettit says that electrical treatment often works wonders, causing an increase in the size of the uterus, and sooner or later the appearance of menstruation. Atresia of the cervix may also be overcome by intracervical electrolysis, utilizing for this purpose the well-known dilating properties of the negative pole; frequently a metal electrode will penetrate when all other attempts at dilatation have been in vain.

Tuberculosis of the Female Genital Organs.—MEYER (*Gyn. Rundschau*, 1911, v, 716) reports his experience in 40 cases of tuberculosis of the lower abdomen operated upon in the Tübingen Gynecological Clinic during the last four years. These fall almost equally into two chief types: (1) Outspoken and predominant adnexal disease, the adnexa often being the size of fists, with no involvement of the peritoneum other than intestinal adhesions. (2) Outspoken peritoneal disease, with ascites or tubercles on the peritoneum, the adnexal involvement here being often very slight, with merely small swellings or tubercles on the tubal mucosa. It seems probable that in many of these cases the peritoneal condition was primary and the adnexal involvement merely due to secondary extension. It was very noticeable that all the cases in group one occurred in patients under thirty years of age, and were often accompanied by an infantile condition of the genitals, suggesting the possibility of a congenital affection, or at least of a congenital tendency, or else that the tuberculosis settled here, owing to the imperfectly developed genital organs offering a *locus minoris resistentiæ*. The cases in group two, on the other hand, occurred about evenly before and after thirty years of age. In many of the cases in group one the adnexal tuberculosis had evidently existed for a considerable time without any extension to the peritoneum, so that Meyer does not think one should feel forced to operate as soon as a diagnosis of tuberculosis of the tubes has been made for fear of its extending to the peritoneum, but considers that attempts at non-operative treatment should be made first. When driven to operation, it should, in view of the youth of most of these patients, be the aim of the surgeon to preserve an ovary, or at least a part of one, although this may necessitate a radical operation later on. Although the cases in group two have practically no pain, they do have a marked and increasing swelling of the abdomen, and therefore, as a rule, come to operation sooner than those of group one, in which latter pain is usually present; this pain is in no wise characteristic, however, and is often considered by the patients as due merely to slight menstrual disorders. These pains may occasionally start very suddenly, with peritonitic symptoms, and the diagnosis from appendicitis or ovarian cyst with a twisted pedicle be very difficult. Ten cases out of the 40 died, all more than two weeks after operation. The mortality was much higher in cases of peritoneal tuberculosis, in which the abdomen was merely opened and closed again, than in cases of adnexal disease, in which much more extensive operations were performed, showing that the character of the disease was a much more important factor in the mortality than the nature of the operation. The mortality was especially high in cases where fever was present before operation, so that Meyer considers this a grave prognostic condition. He also found a great tendency for wound suppuration to occur in feverish patients, and thinks that wounds in all tuberculous patients have a general tendency to heal poorly, the tuberculous process often extending to the wound surface, a condition which is sometimes favorably influenced by the action of direct sunlight. He also considers existing lung lesions a very grave complication, as they generally show a tendency to grow worse after operation, so that no operation should be undertaken in these cases without the most careful consideration.

OTOLOGY.

UNDER THE CHARGE OF

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A Foreign Body (Revolver Bullet) in the Temporal Bone Removed by Means of the Radical Operation.—WILHELM WALLER (*Monatsschr. f. Ohrenheilkunde*, 1911, p. 803). The patient was a woman, aged twenty-five years, who came under observation on account of a fetid discharge from the right ear of two years' duration, accompanied by severe tinnitus; the objective symptoms were those of a chronic suppurative middle-ear disease with the additional symptoms that pressure in the middle ear, incident to cleansing by means of the cotton-tipped probe, was accompanied by sharp contraction of the muscles supplied by the superior branch of the facial. Conservative treatment proving unavailing, the radical operation was decided upon, and the author was then first informed that the patient had attempted suicide two years previously by shooting herself in the right ear. Operation revealed two large pieces of metal lying close together in the antrum, the walls of the aditus being, furthermore, studded with small pieces of metal, the dura, which had been exposed over a considerable area, was normal, and the facial was bared to a short extent by absence of the wall of the nerve duct. The postaural wound was closed by primary suture, and, at the end of two and a half months, the cavity was healed and fairly epidermitized.

The Labyrinth Fistula Symptom.—G. ALAGNA (*La pratica otolaryngoiatrica*, 1911, No. 6). For the purpose of this test Alagna uses preferably the Siegle otoscope or the rarefactor of Delstanche, tightly inserted in the external auditory canal. The symptom is liable to be of negative value in young children and in adults with intact vestibular apparatus. During compression the nystagmus is directed toward the diseased, and during aspiration toward the sound side. The most frequent location of the fistulous opening is in the horizontal semicircular canal, and in cases of chronic suppurative middle-ear disease accompanied by loss of hearing, and in which the fistula symptom is positive, the radical operation, giving access to the horizontal canal and including the adequate opening of the labyrinth, is indicated. The fistula symptom has also been observed by Alagna in cases of non-suppurative labyrinthitis in hereditary syphilitics.

Examination of 200 Persons over Fifty Years of Age in Reference to Their Hearing Power.—TORRINI (*Monatsschr. f. Ohrenheilkunde*, 1911, pp. 2 and 3). The isolated observations of depreciation of hearing for certain classes of tones in persons over fifty years of age, and especially the results of tests concerning the upper tone limit, are substantiated in the carefully conducted investigation of Torrini,

who was able to determine a distinct depreciation both in the functions of sound transmission and of sound perception. In the speech tests the depreciation was especially notable for the whispered voice. In all cases in which the objective examination revealed the consequences of past inflammatory processes in the middle ear the depreciation of hearing was increased.

Suppurative Inflammation of the Middle Ear Relieved by Anti-syphilitic Treatment.—H. BOURGEOIS (*Annales du Maladie de l'oreille, etc.*, June, 1911). In this paper Bourgeois mentions the lack of precision in the determination of the immediate etiology as compared with the cases of grave impairment of hearing in the non-suppurative aural manifestations of syphilitic disease. While otorrhea is a frequent accompaniment of an aural lesion in hereditary syphilis, it appears usually as a sequence of pharyngeal ulceration, and develops as the result of a secondary infection of the buccal and pharyngeal mucosa, and general treatment is usually ineffectual. The case reported, however, would seem to demonstrate the possibility of the existence of middle-ear disease, of syphilitic origin, amenable to constitutional treatment—a woman, aged forty years, with a suppurative disease of the middle ear, insidious in its development and indolent in its progress, subjected to the usual local treatment for a period of three months without amelioration, but healing at the end of ten days of mixed treatment. The distinctive characteristics of the suppurative middle-ear disease of syphilitic origin are its indolence and the multiplicity of the perforations, as in tuberculosis, but lacking the excessive discharge, the rapidity of progress, and the extent of destruction characterizing the latter disease.

Operation for the Relief of Intense Labyrinthine Vertigo.—MATTE (*Archiv f. Ohrenheilk.*, Band lxviii, Heft 3 and 4), in a previous communication, gave two reasons for operation upon the non-suppurative labyrinth, where other remedial measures had failed of effect, namely, unbearable subjective noises and unbearable incapacitating dizziness of labyrinthine origin, and in the present communication cites a case in support of his proposition. Thirteen years before his admission to hospital under Matte's observation, the patient had received a severe blow on the left side of the head, followed by unconsciousness and severe hemorrhage from the mouth, the nose, and the left ear; in the course of a few weeks, however, he had so far improved as to resume his usual farming work, but with a total loss of hearing in the left ear. Seven years later the patient began to have recurrent attacks, with sudden onset, of vertigo, nausea, and vomiting; these attacks sometimes lasted from one to three days, including the subsequent prostration, and later, from one to two weeks. At the end of two years the patient had become physically weakened and mentally depressed, and an exact determination of his static and auditory condition was only measurably attainable. The left drum-head was largely cicatricial, the malleus deeply retracted, and the patient complained, in addition to the sense of instability, of a constant high-pitched subjective noise accompanied at times by a deep-toned pulsatory murmur. In view of the long period since the original injury, thirteen years, and the increasing

severity of the labyrinth symptoms, operation was decided upon and effected postaurally, with removal of the cicatricial drumhead and the major ossicles, broad chiselling of the lateral wall of the epitympanic space, and opening into the labyrinth above and below the facial nerve, with subsequent curettage of the labyrinth interior; the canal was then divided medially, the resultant flaps secured in place by gauze, and the postaural wound closed by suture. The healing of the wound progressed without incident, one month after operation there was occasional subjective noise but no vertigo, and there had been no recurrence up to the time of the last report, a period of two years, but there was a mildly persistent, high-pitched, metallic subjective noise, more constant than in the period immediately following operation, and increasing in intensity and in depth of tone coincidently with over-excitement or overexertion.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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A New Pasteur Institute.—Some of our readers may not yet be aware that a splendid Pasteur Institute has just been opened in Algeria. In 1894 the Algerian Government began this work, and on a comparatively small but useful scale carried on protective work in human and veterinary disease. In 1909 a large sum of money was set apart by the Algerian Government, and Professor Calmette was intrusted with the direction of the construction of the new Institution, which now takes its place among the splendid laboratories of the world. A staff of eleven workers is already in charge of departments of Medical Bacteriology, of Agricultural Bacteriology, of Veterinary Medicine, and of Rabies. In the vicinity are two annexes, one of which is devoted to protection against rabies, and the other to veterinary pathology and the preparation of sera.

The Chemistry of the Cell.—In the symposium upon the chemistry of the cell, held under the auspices of the Columbia University Biochemical Association in February, 1911, some extremely useful and pithy communications were made relative to our present knowledge of the cell, which contain some points that it may be useful to recapitulate. The series of papers appears in the *Biochemical Bulletin*, vol. i, No. 1, September, 1911. W. J. GIES points out the importance of intracellular water which is contained free in the cell, is subject to evaporation, diffusion, and dehydration and forms the general medium of exchange inside the cell and between the cell and its liquid environ-

ment. It is in relatively stable equilibrium with the water among the adjacent tissue-cells, the water in the circulation, and that in the secretions and excretions. When the cells are desiccated they may lose from 50 to 98 per cent. of their weight, and this water it is which lodges the soluble intracellular compounds, and which is therefore concerned in osmotic processes. Of the intracellular water which is not free, some unites molecularly with colloids in a way comparable to the water of crystallization. W. H. WELKER points out that incineration does not give an accurate estimation of the inorganic substances contained in the cell, and aqueous extraction also fails to be accurate by reason of the production of free inorganic molecules in the process. Most of the true saline material in the cell is in solution in the intracellular water, either as molecules or ions, and is liable to enter into osmotic action and into new chemical combinations. In addition there are numerous combinations made with organic substances, which combinations are essentially of two types—one relatively unstable, like glucose-sodium, or sodium proteinate, and the other relatively stable, such as the phosphoric acid radicals in lecithin, and the iron in nucleoprotein. Substances of the latter type do not readily undergo hydrolysis, while those of the former are apt to do so. Finally there are absorption products between intracellular inorganic substances and colloids. Referring to intracellular carbohydrates, E. D. CLARK indicates the widespread storage of glycogen in the liver, muscles, and to some extent in all animal cells and organisms. The blood receives a supply of glucose from the alimentary tract, and yet preserves a constant glucose content; the cells in turn obtain from the blood the glucose necessary for heat and certain protoplasmic combinations. Maltose exists as free sugar in the animal cell in small quantity, derived probably from glycogen, while lactose is a constituent of the mammary cells during lactation. Combined carbohydrates exist in the nucleoproteins and the glycoproteins, while special tissues contain special combinations, such as the cerebrogalactosides of the nervous system and substances, such as jecorin, found in the liver, heart-muscle, and elsewhere. Many of the intracellular carbohydrates are soluble in the cell water, and therefore can diffuse; and while relatively stable, they yet enter into various combinations with water, salines, other carbohydrates, lipins, and proteins. Lipins are organic "fatty" substances insoluble in concentrated neutral saline solutions, but soluble in hot alcohol or warm ether, or both; they are largely in the guise of "masked" fat combined with other protoplasmic substances. Complex lipins such as lecithin and kephalin may contain a considerable amount of inorganic substance linked with the fatty part, and combinations of lipins and amino-acids occur synthetically, doubtless quite comparable with combinations that exist in protoplasms. ROSENBLOOM, in reviewing the lipins, refers to the numerous compounds of lipins and proteids as seen in the vitellins and many combinations into which lecithins appear to enter. With the carbohydrates, too, both synthetically and in the cell, the lipins form compounds as they do also with alkaloids; it is, perhaps, to such a combination in the heart muscle cells that the efficacy of digitalis is due, and by similar combinations of lipins and toxins, venoms, etc., or a replacement of part of the lipins by the toxins that the effect of such poisons is brought about. The subject

of the intracellular proteins is more widely understood than is that of lipins, and W. H. EDDY reviews our knowledge of these bodies. From the albumins and globulins of the cytoplasm, and keratin, elastin, chitin, and gelatine in the cell membranes, we pass to the nucleoproteins of the nucleoplasm and of chromatin, the phosphoprotein of the nucleoli, of the linin, and of the centrosomes. These proteins have doubtless much in common, and the protein molecule is to be considered as manifesting basic and acidic side-chains at the same time, though in varying predominance. The basic (NH_2) chains predominate in the histones, the acidic (COOH) in the nucleoproteins, mucoids, etc., while there is a balance in the neutral albumins. These side-chains, too, of different natures, are concerned with the faculty of polymerization possessed by the protein molecules and allow the formation of a great variety of addition compounds; not only this, but they unite with one another, all of which possibilities point to the innumberable forms in which cell proteins exist and to the enormous numbers of relationships into which they can enter. As to the state in which proteins exist in the cell there is necessarily much doubt. Are proteid solutions actual solutions or only suspensions? We cannot tell, but we do know that the study of relatively simple substances like arsenious sulphide indicates that it can exhibit every character of suspension, colloidal solution, and crystalloidal solution, so that it may almost be predicted that the time will come when colloid and crystalloid states will be considered as merely modifications dependent on differing size of molecules. The process of adsorption, by which combination of salts and proteins occurs, may be something different, on the one hand, from suspension, and on the other, from solution and chemical union; it may be that there is an adsorptive affinity comparable, in a less perfected degree, to chemical affinity. Intracellular enzymes, dealt with by A. P. LOTHROP, constitute a very difficult subject. Colloidal in nature, they are prone to be impure by reason of their adsorption compounds. While there is much evidence in favor of their protein nature, it is not yet definitely determined that they are proteins; cellular in origin, most enzymes exert their activity in cells, and most intracellular biochemical change is probably due to their activity. This does not apply to the so-called secretion enzymes, which are extracellular in their action. The imperfection of our knowledge of the intracellular enzymes is largely due to the very fact that their existence is closely connected with the cell activity and that they are thus difficult to extract. Without going further than to say that like toxins, the enzymes stimulate the tissues to the formation of antibodies, it may be said that in enzyme action we have probably the most potent factor in the interaction of particles of living matter, and that it supplies the connecting links between the various complex intracellular constituents that have been mentioned.

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